Authentic

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ONE SHILLING and SIXPENCE

Authentic

SCIENCE FICTION MONTHLY

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Authentic Science Fiction is a periodical published on the 15th of each month. This issue is No. 54, and has a publishing date of February 15th, 1955.

IT gives me real pleasure this month to publish Dan Morgan in the lead. Dan is one of the most serious writers I know, by which I mean that he takes his craft seriously. You've read a few of his short stories, and judging by your letters, you have liked them. Now you have him at the top of the tree with his *Lesser Breed*. Tell me how you like it and I'll tell Dan what you say.

I don't have to tell you anything about William F. Temple, whose delightful *Man in a Maze* graces these pages. You all know him as the successful author of the book-film, *The Three-Sided Triangle*, and several other books and dozens of short stories. One of Britain's top-flight science fiction authors, we are very pleased to welcome him to these pages once again.

E. C. Tubb is another author on whom introductions are wasted. Everybody knows him, everybody reads him, and very nearly everybody publishes him. Which is not surprising when he writes stories like *Nonentity*. Good man, Tubb.

Now here's a bit of a game for you. Inside you'll find a story by Eric Wilding. This is a pen-name for somebody you all know very well, who has appeared several times before in this magazine. See if you can guess who it is—I don't say that I'll tell you if you are right, but it will be interesting to know how many different authors' names will be put forward by readers. Straight off, let me assure you that it isn't *me!*

The illustrated supplement is, I feel, even better than last

time. There are some nice pictures that have come all the way from America to give you a preview of a forthcoming science fiction film. We have a further instalment in the "planetary exploration" series, this time dealing with the work of the biologist. And there's a thought-provoking piece on what will happen when the flying saucers land.

Peter Summers is back with an article on a rather polemic note. Seems we're barking up the wrong tree trying to get ourselves integrated with our surroundings. Let me know if you agree with him.

Now you are probably wondering what has happened to the March of Science feature, which did not appear last month and is not included in this. Truth to tell I am hard put to it to produce such a feature regularly. Not enough that would interest you goes on in science, it seems. At least, not enough to make a regular feature out of it. So what I am going to do is to make it an occasional feature. It will be included whenever sufficient things have happencd. Other months you'll get that much more fiction.

THIS MONTH'S COVER

might be on Uranus, Neptune or Pluto. It doesn't matter which. They're all the same, except for size and a few things like that.

In a way it's like the arctic of Earth. Only colder. And deader. With no midnight Sun. Only midnight.

The Sun is one of the specks in the sky. You can't tell which without a book and some instruments. Earth just doesn't exist any more as far as you're concerned. You keep trudging along between the towering black rocks that have never felt a breath of wind. Over the ice, harder than steel. And probably not ice, but some frozen concoction of compounds that would haunt a chemist's dreams.

Now and then you wonder why you keep walking, for there's nowhere to go, nothing to see that you haven't seen already. Then you realise that you keep on walking because there's nothing else to do.

You feel that you might easily just lay down and die—if it wasn't rather too much trouble to find a soft spot. You didn't think space would be like this. You didn't think anything could be as dead and dreary as this mockery of a world. You are bitter and brittle and your heart is full of broken glass.

Until you look through the helmet of the man next to you. He's been with you all the way. A fine pal. And he gives you a wink. You feel better then.

You feel that, maybe after all, there *is* some point in doing what you are doing, though it escapes you in the cold sterility of your present situation. You sigh and take another step. You know, at least, that you and your friends have gone farther from Earth than any other men.

You try to find comfort in the thought.

The Lesser Breed

Perhaps the first journey to the stars will not be so glorious as we think

by DAN MORGAN

Before the advent of the now universally accepted theory, the primitive members of our species passed from generation to generation a number of interesting myths as to the origin of Man, and the reasons for his undisputed position as master of the Galaxy. It will be the purpose of this thesis to examine the validity of these folk tales with reference to present day scientific knowledge . . .

THE IMAGE ON THE radiography plate should have been that of a three month old human embryo. It was not . . .

Mark Admans, chief medic of the *Astraventurer*, slid the plate back into the container. His pale, strong nosed face was a mask of professional calm, as he looked across the desk at the woman.

"Is everything all right, doctor? Please tell me." The latent hysteria of a pregnant woman was implicit in her every movement. She leaned forward, her sweating fingers knotting a small pink handkerchief. "My baby is not going to be . . . different, like those others, is it? I swear— I'll kill myself!"

"There's nothing to worry about, believe me," lied Admans. "It's a little too early

to speak with certainty, but I see no reason why you should not produce a healthy, normal child. Admittedly there have been a few unfortunate incidents; space conditions are, after all, abnormal—but that is no reason to occupy your mind with morbid fantasies. For your baby's sake, and your own, I beg of you—please don't."

He rose from his seat and placed a hand lightly on her shoulder. "Just run along now. Keep up the exercises, and don't forget to take the tablets as directed. I'll have another look at you in about ten days time. O.K.?"

The woman returned his smile uncertainly. "Thanks a lot, doctor. I'm sorry if I've been silly and scared, but people talk about these things so much."

The door closed behind the ripening figure. Admans' sharp, grey eyes narrowed and he ran his thin hands through his corn-coloured hair. People talk . . . This was one helluva job!

He walked back to the desk and pressed a button on the intercom.

"Major Tutin, here!" snapped the precise voice of the administration officer.

The medic's face was grim. "Hallo, Tutin; this is Admans. I've got to see you right away."

"Sorry, old man, can't be done. Absolutely up to the neck in paper work. Make it some other time, eh?" The veneer of flippancy was thin; beneath it Admans detected a note of irritation.

"No!" The medic's normally soft voice rose in pitch. "The paper work can wait—this is important. I'm coming straight over . . . And you'd better see me!"

He slammed the cutoff switch as Tutin began to protest. Reaching behind the desk, he picked up the can of radiography plates and walked quickly out of the room.

The door of the admin office closed with a crash. Major James Tutin, seconded from World Police to take disciplinary charge of the *Astraventurer* project, glared at the compact figure of the little medic. His dark, crew-cut hair and pencil thin moustache bristled indignation.

"Really, Admans! This is most irregular."

"You have the right word," said Admans. He slammed the can on Tutin's desk. Wrenching it open, he pulled out a plate and thrust it in front of the officer's nose. "Irregular as hell! What are you going to do about that . . . pass an amendment to Standing Orders? I can't keep on babbling about unfortunate accidents much longer—they just won't believe me."

Tutin looked at the image with an expression of delicate distaste—even his layman's eye could detect something very wrong. "What action are you taking?"

"My God! What can I do?" Admans threw the plate from him. It skittered to a standstill on the other side of the room. "I'll leave it another week or so, and make a further examination. Then, if there's no change—and there won't be—I'll have to operate to save the mother.

"Do you realise that this is the tenth case to date? Since the fourth year of the expedition twenty-five per cent. of the pregnancies aboard this ship have resulted in non-viable monsters. And we must have children! The whole planning of the project is based on the assumption that when we make a planetfall in twenty-five years time, there will be enough youngsters to establish a healthy colony. Without children this is just a one shot—the whole effort will be wasted."

Tutin eyed the medic coldly. "I am perfectly aware of the plan. We are agreed, I take it, that these mutations are due to some radiation that our ships have not hitherto encountered in space? The physicists have used every available type of detector, without being able to give us anything definite to work on. That being so, there is nothing we can do about it."

"There must be something —some way of improving the ship's radiation shielding," interrupted Admans.

Tutin fingered the surface of his desk irritably. "My function is the delegation of work to specialists. If they fail, I must take their opinions

as authoritative and work accordingly. The physicists are unable to construct efficient shielding against a radiation which they cannot detect, that is patently obvious. They tell me, however, that we should pass out of the field eventually. Until that time, we must do our best to maintain the morale of the colonists.

"These people knew full well that they were venturing into the unknown. They were warned that the project would be dangerous when they volunteered. They must be conditioned to regard this as one of the normal hazards of space. You make too much of these things, Admans—when we pass out of range of the radiation the whole thing will be forgotten."

Admans clenched his fists. Tutin seemed to forget that the colonists were just ordinary civilians, not drilled and disciplined front line soldiers.

"It's not as simple as that. This effect may already be deep down in the chromosome structure of every human being aboard this ship. A permanent modification of the genes—a seed of destruction that will allow them to breed nothing but non-viable mutations."

"Can you prove that?" Tutin asked, wearily.

"Of course not, man! I'm just giving you my honest opinion as a physician." The frustration behind the words was apparent. "Many years ago, when Goldfarb started work on his Android project, he covered the field of human genetics exhaustively. In the end he was forced to abandon his work in that direction and synthesise a simplified cellular structure—he just had no instruments that were capable of examining the structure and defining the properties of human genes with a sufficient degree of accuracy."

Tutin leaned forward. "Suppose you are right—what do you suggest we should do?" he said, quietly.

"Turn back to Earth and warn them of the radiation field before other ships follow. They could then send out a specially equipped expedition

to investigate. Under the present conditions, any colony we establish will prove abortive—surely you can see that? Project *Astraventurer* is already a failure!"

Tutin rose to his feet and slammed a fist on the desk top. "Don't be a damned fool, Admans! You ask me to take that kind of action on the basis of an opinion? Have you any conception of the cost of launching Project *Astraventurer?* The years of work—the billions of credits? Just suppose we did return—and then your theory was proved incorrect. You could be wrong, you know."

"I suppose so," said Admans. He could see that further argument was futile. Tutin would rather follow his orders, even though they might lead to certain destruction, than use his initiative and risk disgrace back on Earth. He picked up the container.

"After all . . . men have recovered from sterility induced by radiation," continued Tutin. "Surely that is . . ."

"Forget the whole thing!" shouted Admans.

He turned and walked out of the office.

The android was sitting in a corner with Mayo, when Admans entered the Wardroom.

The tables around the couple were noticeably empty. The trouble with Mayo was that he had no social sense, he had been around androids too long. Not that Admans was anti-android—he had never had any particular thoughts in the matter—but Mayo, in his position as Android Liaison Officer, should have known better than to bring the creature in here, amongst the civilians, techs and officers.

The androids were built for space. Humanoid in form, their bodies were encased in an impervious plexiplast envelope, which took the place of the normal human's skin. Animated space suits. In their chest cavities they carried renewable oxygen cylinders which made them independent of the ship's air supply.

Operating and servicing the engines of the starships, they were able to work and live in the *Styx*—the airless outer shell.

Out there in the searing radiation, no human could live without armour so heavy that it rendered him a useless spectator. Androids were the crew of all spaceships—men, the passengers.

Despite this—or rather, because of it—in the company of men, the androids were less than the dust. A minority to be spurned and hated by the race who created them. Not for their faults, but for fear of their very efficiency in doing something of which man himself was incapable. Admans remembered the wry grin on the face of his psychology lecturer, many years before, when he had discussed this Frankenstein complex.

Admans poured himself a drink at the bar and walked over to Mayo's table.

"Hallo there, Mark." The liaison officer's thin, dark face smiled in welcome. "Are you going to come and sit with us? For a minute, I thought you'd joined the opposition."

Admans eased himself into a chair. The android faced him across the table in silence, no hint of emotion on the immobile face.

"This is Jimmy Granella—he's in charge of the engine room," Mayo said.

Admans nodded. The name meant nothing to him—the androids on this trip were all Granellas, and to the ordinary human, all androids of the same species looked alike. Only specialists like Mayo were able to distinguish one from another.

"Jimmy came inboard to give me his routine report," said Mayo in answer to Admans' unspoken question. "Saves me climbing into sweaty, stinking armour and going out into the *Styx* for it. Good idea, don't you think?"

Admans sipped his drink. "O.K. by me. But what does Tutin say about the arrangement?"

"That darned pinheaded bureaucrat—who does he think *really* runs this ship, anyway?" Mayo said.

Admans realised suddenly that the liaison officer was

drunk. He looked over his shoulder at the other occupants of the wardroom. "Take it easy, Charley—you know how touchy some of these boys can be!" he said, urgently.

The android rose from his chair. His broad, six foot form towered over the table. He looked at the liaison officer. "With your permission—I shall go now, Mayo Officer." The deep voice issued from between rigid lips.

"Stick around, Jimmy," Mayo said. "Admans here won't bite you."

He laughed—too loudly.

"Let him go, Mayo!" said Admans, softly. "Can't you see he knows that he shouldn't be in here?"

The android still hesitated, awaiting instructions.

"O.K., Jimmy — do what the doctor says," Mayo said.

The Granella turned to leave, and for a moment his pale, pink albino eyes met those of the medic. Admans searched in vain for some interpretation of their expression.

The two men watched the android leave the room in silence. The aura of tension that hung over the group of drinkers round the bar seemed to lift slightly.

Admans turned to his companion. "What are you trying to prove, Charley?"

One corner of Mayo's thin mouth dropped. "Don't talk to me that way, Mark. I love you like a brother, but just tone it down. I'm not trying to prove a thing . . . I know." He waved his arm in the direction of the bar. "But these . . . passengers. Where do they get this master race complex from, anyway? Do they ever stop to consider what would happen if the androids suddenly decided that they were the master race?"

"And does it ever occur to you that maybe they lie awake at nights, scaring themselves stupid over just that possibility? Forget it, Charley." Admans sipped his drink slowly. "You've got a chip on your shoulder about this thing—you always did have, and it's getting bigger. Can't you see it's no use

beating your brains out? That's just the way things are."

Mayo sneered. "You're as bad as the others. Look at the androids—they're stronger, more adaptable, and in their own fields, equally as intelligent as a human. On the first two counts alone, they have a far higher survival rating than us."

"Yes, I know all that stuff," interrupted Admans. "It goes on—if they could breed, natural selection would wipe out the human race in a few hundred years. You ALO's are all the same, carrying your own crosses and digging your own graves."

"Sorry, Mark. Maybe I do get boring at times," said Mayo, in a quieter tone. "But that Tutin gets in my hair. He's been trying to talk me into letting him have a direct hookup with the engine room —says there is too much chance of error in the system of passing all orders to me for relay to the androids. I think one of the cybernetics boys must have been talking to him about information loss—but it's not quite the same thing when you're dealing with androids. How do you explain anything to a clown like that? He's not trained to handle the Granellas—that's my job."

Admans frowned. Mayo might be drunk, but he was right. Android liaison officers were trained at the Goldfarb laboratories, alongside the group of androids they were intended to direct. Mayo had known the *Astraventurer's* Granellas since the moment they were removed from the vats. And incorporated in the taped information that had been fed into the *tabula rasa* of their minds was a prime directive of obedience to his orders. Any attempt to usurp Mayo's authority could have dangerous consequences.

"Even Tutin couldn't be that stupid," Admans said. "Forget it, Charley. I've got troubles of my own."

Mayo looked up sharply. "Another mutation?"

Admans nodded. "I examined another woman today, and it was the same story. The project is finished. This thing, whatever it is, will affect us all. I told Tutin that if he

didn't turn back, the whole thing would be just a waste of time and effort. He refused, of course."

"You really think it's that bad, eh?" said Mayo.

Admans hesitated, wondering how to word the suggestion that had been bubbling in his mind for the last ten minutes. "Look, Charley—there's no two ways about this thing. We've got to turn back. I can't go on much longer, carving these horrible monsters out of the wretched women. If we can't stop it—and there seems no way—we must make certain that it never happens again. You can see that, can't you?" He paused. "The androids control the ship—they'll obey your orders without question . . ."

Mayo's eyes narrowed. "Hold it, Mark. I don't think I want to hear any more. You don't realise what you'd be asking me to do. Hell, I'm not worried for myself. But if this thing was handled in the wrong way, it could wreck all the work they've been doing at Goldfarb for the past fifty years. Can't you just see the headlines? ANDROID MUTINY ON STAR SHIP. It's just the sort of thing the anti groups want."

Admans bit his lower lip. "It doesn't need to be that way. They'll see that it was the only thing we could do, under the circumstances."

"Not the only thing," said Mayo. "We could go on. So we don't breed like rabbits? Let's face up to it—we've still got our health and strength, and the Granellas will work for us as long as we live. I've had a bellyful of Earth—this way we get a chance to live our own lives the way we want." He picked up his glass. "I'll drink to that—a short life and a gay one. After we're dead—so what?"

Admans lit a cigarette. His throat felt tight as he drew in the smoke. Sooner or later it would have to be told. "The woman I examined this afternoon . . . was your wife," he said, quietly.

The liaison officer's body went rigid. The drunken flush drained from his features and the knuckles of the hand that held his glass showed white.

"The damned little fool! Why didn't she tell me? Why?" His voice was a strained hiss in his throat.

"You're not always an easy man to talk to, Mayo," said Admans.

"I must go to her—now." The liaison officer's teeth were bared, his face a twisted mask of anguish. He slowly replaced the glass on the table.

Admans laid a restraining hand on his arm.

"No—wait! I haven't told her what the radiograph showed. The . . . child will have to be removed, of course, but I think she will be O.K. But I don't want her disturbed —a woman in her condition might do anything. Promise me you won't mention this to her."

Mayo rose to his feet, with a dreadful sobriety. "A short life and a gay one," he said.

Admans watched as he walked out of the ward room, like a man carrying a heavy burden.

The intercom system burst into sudden life.

"*Admin office calling Doctor Admans . . . Admin office calling Doctor Admans—please report immediately.*"

Admans finished his drink swiftly and walked out of the ward room. How like Tutin—always unavailable himself, he had no compunction about calling on another member of the staff, whether on or off duty.

He opened the door of the admin office. "Ah, come in, Admans," said Tutin. The false joviality sickened the medic. "Johnson here has a few ideas that may interest you."

Admans nodded to the third occupant of the office, his resentment increasing.

Pete Johnson was the elected representative of the colonists who sat in on all staff conferences of a general nature. A six foot redhead of around thirty-five, whose permanent dress was shirt sleeves and faded blue denim trousers.

Johnson had been a farmer back on Earth—not a good one, Admans suspected—otherwise he would not have volunteered for the *Astraventurer* project. Johnson was

not the pioneer type; just a small-minded, blustering loud mouth who had pushed himself to the forefront in the gathering of honest, taciturn workers who made up the majority of the colonist community.

Both Admans and Mayo had fallen foul of Johnson several times during the past four years. Admans, when the man had stormed into his office and insinuated that the high infant mortality rate was due to the medic's inefficiency. Admans had damned the tide of ignorant bluster by showing Johnson a few specimens, and explaining the real cause of the trouble.

Johnson had promptly gone out and bolstered his own self esteem by blurting the confidential information all over the ship, causing unnecessary anguish to his fellow colonists and earning Admans a sharp reprimand from Tutin.

The trouble with Mayo had been inevitable. Johnson, like most of his kind, was anti-android and made no bones about stating his views. There had been several embarrassing scenes in the ward room, when Mayo's naturally truculent disposition had flared up in the face of Johnson's flat-footed humour.

"What's the trouble, Johnson?" said Admans, warily.

"It's about these . . . queer kids our women keep on having, doc." The freckled face broke into an obviously ingratiating smile. "I know it ain't your fault—you're doing your best. Like you told me, there's some sort of rays doing the damage—getting down inside us and twisting things up."

"That's roughly the theory," said Admans, coldly. "Although the physicists have been unable to isolate the radiation, so far."

Johnson pulled an old, charred pipe out of his pocket and sucked on it noisily. "Well, I been thinking, doc. The *Astraventurer* is travelling pretty fast through space. That means that this radiation is big, perhaps millions of miles deep."

Admans shifted impatiently in his chair. "I should say that's pretty obvious."

"Maybe not," said Johnson, his large, discoloured teeth showing in a triumphant smile at his own cleverness. "Suppose it was small—just big enough to cover the ship. And moving along with us. That would work the same, wouldn't it?"

"Really, Tutin! Do I have to waste my time listening to this rot?" exclaimed Admans. "What kind of a radiation field would cling onto a ship like a leech, and chase it halfway across the galaxy?"

"What Johnson is getting at, in his own inimitable way, is that he believes the radiation is being produced inside the ship itself," said Tutin.

Admans spoke with slow exasperation. "That's ridiculous, and you know it. This ship is the finest Earth yards have ever produced. Years of work and experimentation went into her building. Anyway, the Grenbach drive is in the outer shell of the ship."

"That's what the Major said," intervened Johnson, stubbornly. "But I believe that the radiation is not an accident. Somebody on the ship is causing it—somebody who wants the project to fail. You said yourself that if it goes on much longer there'll be no normal births at all—and we all know what that would mean."

Admans' eyes widened. "That's madness—whoever it was, would be destroying himself at the same time. So far, the radiation has only affected the delicate genetic mechanisms of the body, but we can't be sure that it will stop there. Those pitiful women—no human being could be so evil as to cause them such anguish."

Johnson laid his pipe on the desk and leaned forward. "No *human being*, doc—but an android isn't a human being! Radiation doesn't hurt him—he's built to take it."

So that was it—the witch hunt was on! Admans turned to Tutin. "If you believe this fairy story, why haven't you brought Mr. Mayo into the discussion? Or do you prefer to listen to this—expert? Mayo is the only man on this ship who really understands

androids. He should be consulted."

Tutin's eyes were veiled. "I did not consider it advisable to involve Mayo at this stage. He is rather fanatical about his charges."

"But surely his opinion is necessary under the circumstances?" persisted Admans. "He is the only one whose work takes him into the *Styx*. If there were any truth in this preposterous allegation, he would be the one most likely to know."

"Exactly," Tutin said.

Admans was incredulous. "You mean, you don't trust him? You would rather listen to the babblings of this half-witted agitator? Perhaps I should have told you that the radiograph I showed you this afternoon was of Mayo's wife. Do you seriously believe any man would do a thing like that to his own child?"

Tutin hesitated. One hand moved to finger his moustache. "This is not a personal matter, Admans. I am in charge of this expedition. You have your job to do—but I have to co-ordinate the whole project. To do that, I must have the full picture of what is going on. This man came to me with a plausible theory, which could account for the trouble we are having—I had to listen to him. I wanted your opinion, because you more than anybody should realise the seriousness of the position."

"I'll give you that, in two words," broke in Admans. "It stinks! And if you believe it, you're an even bigger fool than I took you for."

He kicked the chair from beneath him and stamped out of the office. Walking along the corridor, his rage began to simmer down a little. He realised that he had allowed his own personal feeling of animosity towards Tutin and Johnson to goad him into a rather foolish display of temper. He shrugged —Tutin could take no serious disciplinary action against him —his function was too important to the well-being of the project.

Admans entered the main corridor of the staff living

quarters. About twenty yards ahead, a knot of men and women stood around an open door. One of the men looked up as he approached.

"Hey, doc! You're needed here."

Admans quickened his pace. He realised with a lurch of apprehension that the open door was that of Mayo's quarters. The crowd parted and he walked into the room.

Kolsky, one of his orderlies, was bending over the still figure which lay on the bunk. In his hand was an oxygen mask, which he was applying to the face of the patient. Despite this, Admans recognised the unconscious woman as Mayo's wife. The liaison officer was slumped in a chair on the other side of the room, his head cradled in shaking hands.

"All right, folks—the show is over!" said Admans, closing the door. On board the starship any event, however unpleasant, was a welcome change of monotonous, routine existence and was sure to attract an audience of rubbernecks.

Kolsky looked round at the sound of his superior's voice. His lips were down-turned at the corners as he pointed with his free hand to the figure on the bunk. He shook his head slowly.

Admans walked over and felt the limp wrist. There was no pulse. He eased the oxygen mask away—the woman's face was blue. "Stimulants?" he asked.

"I gave her two grains of coprazene immediately," said Kolsky.

There was nothing more to be done. Admans handed the mask to the orderly. He pulled up the white sheet and covered the ghastly face of the dead woman.

"What happened?" he asked.

Mayo pulled himself up from the chair and lurched across the room. "I found her hanging when I got back here. I called the sick bay, right away."

"Didn't you cut her down first?' Admans said. "If you had. . ." The expression on Mayo's face would not let him go on.

"Hell, Mark, I'm all mixed up—I just don't know any more. Lay off, for God's sake!" The liaison officer's thin shoulders heaved with dry retching sobs.

Admans turned to the orderly. "Fetch a stretcher along and get that out of here," he said, softly. He walked over and took Mayo by the arm. "Take it easy, feller. Don't blame yourself—these things happen. A woman in her condition is not always normal in her mental reactions. The fear of this mutation business must have preyed on her mind." He steered the man towards the door. "Come along to my cabin. I'll give you a shot of something to straighten you out a bit."

"Why should she do a thing like that?" said Mayo, dully.

Admans ignored the question. He was searching himself for some deficiency in his manner that could have led the woman to suspect the truth. He dismissed the idea. The woman had obviously been unstable—listening to the rumours that bred and increased in magnitude in the closed circuit society of the starship had pushed her over the brink of madness.

Mayo was like a man in a trance. He allowed Admans to guide him into the small sick bay and lay on the bunk without protest.

The medic picked up a hypodermic and charged it carefully. He bared the liaison officer's arm—the man scarcely seemed to notice the jab as the needle thrust home.

"Right, feller. Just you lie there and take it easy," Admans said. "If you want anything, my bunk is right through that door. O.K.?"

Mayo's eyes were already closing under the influence of the sedative as he left the room.

Admans removed his outer clothing and lay down on the bunk in his own room. With a determined effort, he dismissed the problems that presented themselves and composed himself for sleep.

Admans awoke—the stench of foul air clutching at his throat. He lay for a moment, fighting a spasm of nausea that

surged through his body, then reached out and switched on the light. The cabin's air conditioning duct must have been accidentally blocked.

He eased himself out of his bunk and staggered to the door, sleep and lack of oxygen clutching at his consciousness. Unfastening the lock with fumbling fingers, he flung it open and waited for the cool air of the corridor to sweep the sewer stench that clogged his lungs.

The improvement was only slight, just enough to clear his head a little. The air of the corridor was almost as foul as that of his cabin. He realised, with a twinge of horror, that the entire air conditioning system of the ship must be faulty.

The oxygen plant was in the outer shell, up in the nose, well shielded from the radiation of the engines. Being in the *Styx*, it was tended by the androids, *who had no need of air themselves.*

Behind him, the intercom buzzed urgently. He walked over towards it, his respiration struggling to gain life-giving oxygen from the foul air.

He flipped the switch. "Admans, here."

"Hallo, Admans—this is Tutin. Is Mayo with you? Those damned Granellas of his must have decided to finish the job by suffocating us!"

"Yes. He's in the next room. Hold the line. I'll go and get him. And take it easy on that android stuff—this could be a genuine breakdown, and Mayo has been through a tough time."

Tutin's voice was sharp poison. "I know—why didn't you report the suicide to me? But we'll talk about that later—get Mayo!"

Admans opened the door of the sick bay. The bunk on which Mayo had been lying was empty. The room was unoccupied.

Back at the intercom, he said: "He's gone!"

Tutin cursed. "Better call the androids on Mayo's control circuit," Admans suggested.

"I already tried that," shouted Tutin. "The transceiver is not working—there's no way of communicating with the *Styx*."

Admans felt a surge of relief. "That's where you'll find Mayo," he said. "When his control circuit blew out, he must have put on armour and gone outside."

"Perhaps," replied Tutin. "But we can't afford to take any chances. In a few hours the air will be absolutely unbreatheable. I'm going out to the *Styx* and check on the air conditioning plant myself."

"Do you think that's wise? Mayo is in charge out there—why not let him handle it?"

"I'm not at all sure that he's capable," said Tutin. "I'm going!"

Admans thought fast. He had no love for Tutin, but he realised that the strain Mayo had undergone would not render him likely to tolerate any interference.

"Any objection to my going with you?" he asked. "I may be able to help."

"Suit yourself," barked Tutin. "I'm on my way to lock four now."

The outer door of the airlock closed behind the two armoured figures, leaving them in the airless dark of the *Styx*. Tutin switched on his headlight and Admans followed suit. Slowly, like grossly malformed robots, they started to walk towards the nose of the great ship.

The blackness was unrelieved, except for the occasional shape of one of the light alloy girders that formed the ship's skeleton.

Tutin's voice came sharp and tinny through the armour radio. "The conditioning plant is about fifty yards ahead."

He gestured with a mailed claw. For the first time, Admans noticed that the admin officer was carrying a blaster.

They made their way cautiously between the girders, which grew closer together as they approached the nose. Out here, away from the cushioned kernel of the human living quarters, the grinding sub-sonics of the drive were an ever present vibration, permeating through the metal of their armour and tearing at every nerve ending.

Admans muttered an exclamation. He stopped and turned as swiftly as the cumbersome suit would permit. His headlight swept in an arc . . . searching.

"What is it?" said Tutin.

"Nothing . . . Just an over stimulated imagination," said Admans. "For a moment I could have sworn I saw something move—something too small to be an android, and too fast to be a man in armour."

Tutin laughed shortly. "Gremlins, eh, Admans? Perhaps you would rather go back to the airlock? I can handle this job alone, you know."

Admans ignored the goad and started to walk forward again.

"There it is," Tutin said, as a wide, ten-foot high door loomed out of the darkness. He moved to one side, the blaster raised. "You open it up."

Admans turned the release wheel slowly. He watched anxiously as the door swung outwards. The short passage was empty. The two men entered and closed the safety door behind them. Ahead lay the entrance to the air conditioning plant. Tutin pointed wordlessly to a small pilot light which glowed on the wall, indicating that the interior was illuminated.

Admans' limbs inside the armour were slimy with perspiration. He fumbled clumsily with the mechanism.

"This time, slow and steady," said Tutin.

The door swung open and Tutin pushed past him into the brightly lighted compartment. The interior was deserted. The huge fans, that were the lungs of the ship, were stationary. If, as they began to suspect, Mayo had done this, he had already retreated to some other part of the ship.

The admin officer walked over to the control panel, the medic following.

"Does that look like a routine breakdown to you?" said Tutin. The main switch which fed the power to the fans was in the OFF position. It was the work of a moment to reach out and thrust it forward.

Admans turned. The fans were moving, gradually gathering speed to pump badly needed air through the arteries of the oxygen starved ship.

"So Mayo came out here to fix the breakdown? He did a fine job." The menace in Tutin's voice was clear, even through the distortion of the armour radio.

"Take it easy, Tutin," said Admans. "You surely can't believe that he did this intentionally—there must be some logical explanation."

"A logical explanation for mass murder? I doubt if your friend Mayo will be able to supply that. He's out here somewhere, so he can probably hear every word we're saying. If he's wise, he'll start his explanations before I find him." Tutin started to move towards the door.

Admans followed. "Where to, now?" he asked.

"The root of the trouble," grated Tutin.

The two men laboriously retraced their steps, past the airlock through which they had entered the *Styx* and on towards the stern of the *Astraventurer*. Tutin's headlight swayed from side to side, searching. The blaster was raised for immediate action.

Admans' armour was uncomfortably hot, despite its built-in refrigeration. His limbs were beginning to ache with the strain of manipulating the heavy suit. He staggered on, searching his mind for some explanation of Mayo's actions—grief at his wife's death was not enough. There must be something more, some problem large enough to cause a psychotic rift in his personality.

"How long are these suits good for?" he asked.

"You could spend twenty-four hours in one—if your mind held out that long," replied Tutin. "I wouldn't worry—WHAT THE HELL!"

A soundless roar of energy burst from the squat muzzle of Tutin's weapon. It expended itself in a flash of fire at a point on the deck several yards in front of them.

"What is it?" Admans shouted, his stomach lurching.

There was a pause whilst Tutin swayed from side to side scanning the darkness. At length he spoke in a subdued voice. "Maybe you were right about the over-stimulated imagination. Just shadows I suppose, but keep your eyes open—he might be anywhere around here."

The vibration of the drive grew stronger as the nightmare search approached the engine room.

"You'd better play it carefully if he is in here," Admans said. "Don't forget the androids are conditioned to obey him."

"Stop talking like an old woman," snapped Tutin. "Open the door and stand aside. I'll handle this my way."

Admans felt a grudging admiration for the man's pig headed courage.

The door of the engine room opened inwards. The two armoured men stood at the top of a short ramp leading down into the interior.

The compartment was illuminated by the greenish glow of floating radioactive particles. Admans picked out the figures of several Granellas at work round the power plant. At the far end, a man in armour was standing in front of a control panel. His back was towards them. Beside him was another android, facing the intruders.

Tutin moved forward down the ramp, as quickly as his armour would permit. "We've come for you, Mayo!" The voice was a cold sentence of death.

The armoured figure turned.

"Well, this is a privilege. I must tell my fellow workers that the commanding officer himself has arrived. Would you like them to stand to attention, major? And who's the handsome young automaton by your side—the lord high executioner?"

"Cut it out, Mayo!" Admans shouted. The man must be drunk or mad, to goad Tutin like this.

Tutin's voice was a sharp lance of sanity. "Did you cut off the air conditioning plant?" The blaster in his hand was levelled.

"Of course," said Mayo, the

words hovering on the edge of laughter.

"Why? You fool—tell us why?" shouted Admans. "He'll kill you!"

"Do you think his reasons will make any difference?" said Tutin. "A man tries to kill five hundred human beings . . . and you ask him why. Shut up, Admans."

Admans looked around the compartment. The androids had stopped working. They stood, unmoving.

"You may be right, major," said Mayo. "Nothing any of us do will make a great deal of difference in the long run. Ask Admans—he'll tell you that the expedition is doomed, anyway. He's right, *up to a point*. Tell me, Tutin—what would you do if you had a pet animal that was slowly dying of some incurable disease? Would you let it drag out its existence in suffering? Or would you kill it out of pity?

"No. Perhaps I'm talking the wrong language. Maybe the word pity isn't in your book. If it was, you could apply it to the human beings on board this ship, who are all dying in a particularly horrible kind of way. They are dying in the future tense, through the generations that will not be born."

"The man's mad," snarled Tutin.

"No—wait!" said Admans, urgently. "What are you doing here, Mayo? Have you been tampering with the drive?"

"Of course not." Mayo sounded surprised at the suggestion. "We humans are dying, but the ship will still go on towards the stars."

Admans could hear Tutin's breath rasping between clenched teeth. He looked across at the man—and saw that he was beginning to depress the firing lever of the blaster.

Admans launched himself forward desperately. The weapon discharged in front of his visor as he crashed to the deck, bearing Tutin with him.

He struggled awkwardly into a sitting position. The blaster lay on the deck beside him. He picked it up. Mayo was still standing by the

control panel, across which the blaster bolt had torn a gash of fused metal. He looked round quickly—the Granellas had not moved.

"Poor shooting, major," jeered Mayo. "Perhaps you'd like to have a try, Mark? Don't worry about the androids; they're conditioned to respect human beings—don't ask me why."

Admans struggled to his feet and offered a helping hand to Tutin. "You fool, Admans. What are you trying to do? I'll have you broken for this!"

"Perhaps," Admans said. He offered the blaster to Tutin, butt foremost. "Here—take back your brains—soldier. But before you do anything else stupid, think on this for a minute. The androids are conditioned to obey Mayo—we don't know for certain whether we could handle them without him. If you killed him, you would automatically forfeit all control of the ship."

Tutin took the weapon and held it loosely by his side. "You may be right," he said, grudgingly. "What do you suggest?"

"We should take Mayo back into the inner shell," Admans said. "He can do no further damage if he is placed under close arrest."

Mayo walked towards them. Tutin began to raise the blaster, but the movement held less direct menace.

"Point one to cool logic, Mark," said Mayo. "Maybe I'll stick around for a while, after all. It will be interesting to see how the master mind here runs the show."

"All right, Mayo," said Tutin. "You've got your reprieve, but only for so long as you're useful to the project, remember that."

The three armoured men walked out of the engine room. The androids turned back to their tasks, already repairing the damaged control panel.

Mayo lay quietly on a bunk in the locked cabin. His mouth was dry and the small aches of his body underlined the need of his system for its accustomed alcohol.

As always, when he was

alone, his thoughts were back on Earth—back in the laboratories where he had spent most of his adult life. Again and again he asked himself why Goldfarb had picked him for this assignment. Others, more qualified, had been sent out with android teams on routine interplanetary voyages—but he had been given the tremendous responsibility of taking the latest miracle of the android makers, the Granellas, on the first Interstellar project.

He had accepted the assignment, naturally, fully conscious of the honour that was thus bestowed on him. The matter of the time factor, and the strain it would involve, had not occurred to him at first. The maximum period of absence from the laboratories on an interplanetary detail was twelve months—he had done two such stints.

During the short trips, tension always arose between the humans and androids. It was inevitable. The liaison officer performed his function as a buffer, secure in the knowledge that any friction would immediately be nullified when he and his detail were transferred at the end of the voyage. But the *Astraventurer* project was different—it would last a lifetime, with no relief. And the Granellas . . .

He swung his feet over the side of the bunk and moved into a sitting position as the door of the cabin opened, to admit Admans.

"Hallo there, Mark. Come to inspect the prisoner? What's the verdict?" said Mayo, with a friendly smile.

The little man's face was grave. "Look, Mayo. I don't pretend to know what made you do what you did—or quite why I stopped Tutin blasting you, back in the engine room. But don't try my patience by being flippant about it."

Mayo's expression hardened. "I had my reasons—and, somehow, it seemed the right thing to do, at the time."

"Why not let me be the judge of that?" asked Admans.

"Sorry, feller—this is something I have to work out in my own way," replied Mayo.

Admans walked over and

seated himself on a chair, facing the android liaison officer. "Tutin asked me to come along and talk with you. We just had a rough passage at the staff meeting—Johnson——"

"I know," interrupted Mayo, grimly. "Johnson wanted me jettisoned out of the nearest airlock."

"That's about the size of it," said Admans. "But what he had in mind wouldn't have been quite as quick or pleasant. He had some strong support, too. Harewood and a couple of the geologists were more than keen on the idea."

"Want me to give you the list?" said Mayo, with a sneer. "I could name them one by one—all the purblind, narrow-minded anti-android swine. And our dear military-minded admin officer—how did he stand?"

Admans pulled a cigarette case from his pocket and offered it to Mayo. "Luckily for you, he's just that. When a man like Tutin is in command, nobody from below tells him what to do. He was forced to make a stand and tell them that you were to be kept alive, pending a court martial which would take place after we have made a landing."

Mayo whistled humorously.

"That must be the longest adjournment in history."

"Maybe," said Admans. "But afterwards, when there were just the two of us, he qualified the statement. Watch your step, Mayo—you can only hope to remain alive just so long as you co-operate with him in the handling of the androids and ensure the efficient running of the ship."

Mayo lit his cigarette. "Between you and me, Mark—that's a soft touch. Those Granellas will take the *Astraventurer* to its destination if they have to go through Hades to get there. They can't do any other with the conditioning that was pumped into their brain matrices."

"Even without you?" said Admans, quietly.

Mayo was suddenly aware that he had placed his life in the hands of the medic. Perhaps some unconscious

mechanism had caused him to do so, in order to test what he thought was an honest, unbiased mind.

"Yes, without me—barring accidents," he admitted. He was silent for a moment, drawing on his cigarette, his dark brown eyes fixed on the face of the other. This man, one of the millions who back through time had been bound in sincerity by the oath of Hippocrates, he owed him something . . . some explanation.

"You asked for this, Mark," he said, at length. "Maybe it will clear up some of your problems and make your job easier . . . maybe not. At all events it's not pretty, but I think you are big enough to take it.

"You know the way Goldfarb works. For the past thirty years his labs have been turning out androids for space, hundreds, thousands of synthetic beings, who are a little less and in some ways a little more than human beings. But don't get the idea that they are turned out on a conveyor belt like sausages—each new team is the result of experience with earlier models and continued research. The Granellas, for example, are the peak of perfection in android development to date . . . maybe for all time.

"Although he is using a simplified cellular structure, Goldfarb has not entirely abandoned the concept with which he originally started his work—that of a truly synthetic *man*. Hence a great deal of his research has been devoted to the human body and its reactions to space travel. The new techniques he and his research team have developed enabled them to probe deeper into the field of human genetics, for instance, than anyone ever has before."

Admans was sitting on the edge of his chair. "What are you getting at, man? For God's sake get to the point!"

"Humour me, Mark. I'm trying to think of a way to make it more palatable," said Mayo. "Goldfarb, despite all the ignorant propaganda that has been levelled against him, is a lover of his fellow men, remember that. Individual humans have spent very little time in space. The

duration of the longest trips has been under three months —with the Grenbach drive, that will take you anywhere you want to go within the Solar System.

"Apart from the first few poor devils who gave their lives trying to pilot their own ships, men have returned from space physically unharmed—to all appearances. But, by examining the cell tissues of people like myself, Goldfarb found that there was, in fact, a residual effect upon the human body—an effect too deep and too infinitesimal to be detected by ordinary methods.

"Where the ordinary short voyages were concerned the effect was not serious, so he filed the results along with his other data and went no further into the matter. Then, several years ago, the World Council Commission on Interstellar Colonisation was formed and preparations were begun for project *Astraventurer*. The Goldfarb laboratories were, naturally, commissioned to supply the necessary android crew.

"Goldfarb immediately realised that the passengers on such a voyage would be exposed to space conditions for far longer than any humans heretofore. In all probability this 'space change', as he had named the effect, would assume more dangerous proportions. He could not predict the exact nature of the danger—his experimental data were insufficient, but he guessed that the first manifestation would be a disorganisation of the genetic mechanisms of the human body."

Admans exhaled sharply. "In other words, he predicted exactly the sort of trouble we are up against now. Why didn't he do something about it?"

"He tried," continued Mayo. "He assembled and correlated all his data, and produced a report which he submitted to the I.C.C. He was told in no uncertain terms to mind his own damned business!"

"I don't believe it!" exploded Admans. "How could they ignore the testimony of a scientist of Goldfarb's calibre?"

Mayo smiled grimly. "Oh, I think they believed him all right—but they squashed his report, all the same. You, and the rest of the poor fools aboard this ship, think you're taking part in something pretty grand, don't you? Man's first outpost in the stars and all that guff. I hate to disillusion you, my friend, but project *Astraventurer* and those to follow are nothing of the kind.

"Remember what Malthus said about war and pestilence being the natural safety valve which prevented the world from suffocating under the weight of over-population? That little ball of mud we call Earth and the rest of the planets of the solar system, such as they are, can only support so many human beings at a reasonably high standard of living. The World Council abolished war and your distinguished colleagues of the medical profession abolished pestilence.

"No doubt some of the members of the I.C.C. truly believe that they are doing something noble and adventurous—but the real guiding force behind the commission is a group of politicians who see the matter in a rather different light."

Admans ran his fingers through his blond hair—his eyes were hard as a sudden chill seemed to freeze his soul within him. "So that's what we are! Surplus stock to be syphoned off into space. If we're killed, it doesn't matter—just so long as we don't come back, the project is a success." His clenched fists descended, beating his knees with brutal force. "The swine! The dirty swine!" Checking the frenzy of rage suddenly, he looked piercingly at Mayo. "You knew this all the time?"

"Of course," replied the liaison officer. "You must realise that even Goldfarb was not certain of the ultimate results of the space change. He gave me all the information he had and left the choice to me."

"And you still accepted the assignment," Admans said. "Why?"

"I told you—the Granellas are the finest androids Gold-

farb has ever produced. I don't expect you to see it my way, but when you've worked with androids as long as I have the thing gets in your blood. This assignment was the chance of a lifetime for me. So there were dangers? Hell! A guy could get killed on the milk run to Lunar City."

"And your wife?" said Admans, softly.

Mayo rose from the bunk and walked over to the other side of the cabin. His back was towards the medic as he answered the question that was the cruel reopening of a festering wound.

"God forgive me, that was the one thing I hadn't counted on." He turned suddenly, his arms outstretched, pleading. "Nobody knew just what form the change would take. How was I to know that it would be—that? She knew nothing about it, of course. Selfish butcher that I am, I kept the truth from her and told myself that it couldn't happen to us."

Admans rose. With an impulsive gesture of sympathy he placed a hand on the arm of the taller man.

"I understand a lot of things, now, Mayo." He turned to leave. "We'll let it rest for now, huh? I've got to think this thing out."

Mayo watched dully as the door closed behind the medic —thinking of the things that still remained unsaid.

Admans walked along the corridor. He was conscious that the burden Mayo had been carrying was now shifted to his own shoulders. With him lay the power to render the lives, and deaths, of the occupants of the ship entirely futile—or to let them play out the grim comedy to its inevitable end, with their illusions still intact.

In either case, his first action must be one which conflicted with his own moral and religious codes. Every human being aboard the *Astraventurer* must be rendered sterile at the earliest opportunity—it was the only way to prevent the flood of non-viable mutations from rising to a hundred per cent. of

all births. A simple operation, but a serious psychological blow to the morale of the project, unless carried out secretly. The old surgeon's joke: "The operation was a success, but unfortunately the patient died," was a mirthless echo in his mind.

Tutin looked up from his desk, as Admans entered the office. "Well—what did he say?"

The medic leaned against the closed door, his mind still in a turmoil. Mayo had made no specific request as to what he should do with this newly acquired information. A man could go mad, trying to carry a thing like this alone.

He wondered for a moment what the admin officer's reaction would be when he was told that the project of which he was so proud was nothing more than a garbage disposal operation. Despite his personal dislike for the man, Admans could not do it.

"He'll work with us," he replied.

Tutin smiled thinly. "Good! He hadn't really much choice though, had he?"

"Don't underestimate Mayo," Admans said. "He'll do what you want—just as long as it suits him."

"I never underestimate people," snapped Tutin. He rose from the desk and picked up a folder of notes. "Come on, let's get going. I want to get to this general meeting before that fool Johnson has a chance to spread any more stupid rumours."

The two men strode out of the admin office and along the corridor towards the main assembly hall. Captain Bowles, O.I.C. ship's police, clicked to attention as they approached the entrance.

"All colonisation and staff personnel, apart from essential duties, present, sir."

Tutin acknowledged the information with a curt nod and walked in. The tall, red-headed farmer was addressing the crowd from a dais at the far end of the hall.

". . . You've had proof that what I'm telling you is right. Who sabotaged the air conditioning plant? Mayo—and he was in charge of the androids. He's a traitor to his

own race, working with those monsters to kill us all. And what does Major Tutin do about it? He sticks the swine in a cosy little cabin, out of harm's way—he'll be giving him a damned medal next!

"When we signed on at the I.C.C. offices, they filled us full of nonsense about new frontiers and rich opportunities—but they didn't tell us about other things. They didn't tell us that our women would go through hell giving birth to monsters, or that we'd be cooped up in this garbage can and suffocated. I'll tell you, friends—we've been sold a pup. And I, for one, have had enough!"

A deep throated murmur rose from the throats of the five hundred colonists. Johnson caught sight of the two men standing in the doorway. Flushed with confidence that he had the sympathies of the audience, he pointed at Tutin.

"There's the man who can do something about it!" he roared. The sea of faces turned. "Let him change the ship's course and take us back to Earth, where we belong!"

The crowd roared their approval. Tutin marched down the aisle, his face a mask of fury. He ignored Johnson as he stepped up onto the dais and turned to face the audience.

"So these are the brave pioneers of Earth!" The voice had the bite of a lash. "Are you all snivelling children, to listen to the mouthings of this ignorant oaf? Do you realise the years of work and sweat that were given to make this project possible? And you want to throw it all away, because you haven't the guts to carry on."

Admans watched in admiration as the admin officer flayed the audience with merciless calm. Here was a man fighting for what he believed in—only Admans knew how wrong he was.

"I kept Mayo alive, because without him the androids could not be controlled efficiently," continued Tutin. "While I am in command of the *Astraventurer*, there will be no turning

back. I have my orders and you people cannot change them. Should you have any stupid ideas about taking over the ship and heading back for Earth, just ask yourselves one question. What sort of a reception would you get when you arrived there?"

"We'll take that chance!" shouted Johnson. He beckoned towards the entrance by which Admans was standing. "Bring him in, lads!"

Admans looked round as Mayo walked through the door, escorted by two colonists holding blasters. The liaison officer gave Admans a twisted grin and walked on down the aisle.

"There's our ticket back to Earth," said Johnson. He produced a blaster from the pocket of his jeans and covered Tutin.

"You'll never get away with this!" said the admin officer.

Johnson leered his triumph. "Don't count on your police, major. They're men like us—not damned military robots like you." He turned to Mayo. "You know what we want from you—what's your answer?"

Admans clenched his fists—if Mayo told the truth now . . .

The liaison officer turned to face the crowd. "What you ask is impossible. The androids are conditioned to obey me, true, but the task for which they are intended was built into their brain matrices. No order of mine will make them turn the ship."

"You're lying!" shouted Johnson, swinging the blaster to cover Mayo.

The liaison officer's mouth twisted as he faced the leader of the mob. "Go ahead, Johnson—blow my head off. You'll be in good company. Tutin wanted to do the same thing earlier."

Admans cursed the man's natural truculence—some day, somebody was going to take his offer. But it must not happen now. He walked quickly down the aisle and up onto the dais.

"He's not lying, Johnson," said the little medic, quietly. "Believe me—if you kill him, you kill everybody on board this ship just as surely as if

you wrecked the drive. Without him we would have absolutely no control."

Tutin was quick to seize the initiative. "He's right, Johnson. Stop acting like a fool!"

Johnson lowered the weapon. His bluster could only carry him so far—the conviction that he had ventured out of his depth was growing in his mind.

"What do you suggest, doc?" he mumbled. "Where do you stand in all this, anyway?"

"I'm with you and the colonists," said Admans. "The ship should turn back to Earth." He turned to Tutin. The face of the admin officer was a mask of frustrated rage. "Can't we approach this thing in a sane manner? Whilst we're fighting amongst ourselves we may be throwing away what little chance of survival remains to us. Admit to yourself the true seriousness of the situation, instead of being blinded by foolish orders which no longer apply. Why can't we investigate Mayo's statements? If they are true, perhaps there is some way of modifying the drives of the androids."

"How do we do that?" asked Johnson.

"By going out into the *Styx*," interrupted Mayo. "The four of us could go—you, Admans, Tutin and myself. If the solution is anywhere, it's out there. You can bring your weapon along to make certain that nobody does anything foolish."

Admans looked sharply at the liaison officer—the suggestion had come too readily. The crowd in the hall were silent, watching the playing out of the scene on the dais.

Johnson shifted uneasily. The colonists would expect some decisive action from him, as their self-appointed leader.

"I don't know," he murmured. "Seems like asking for trouble, to me. Mayo knows his way around out there—and the radiation . . ."

Admans looked up at the tall man, with cold grey eyes. "Scared, Johnson?" he asked, quietly.

The big farmer was in a corner. "No, damn you!" he

shouted. He turned to Tutin. "Do you agree with this?"

"The administration officer should naturally go with such a party," said Tutin, coldly contemptuous.

Mayo grinned. "All the time I get reprieves. You're a bright boy, Admans; perhaps you like the air in the *Styx?*"

Admans said nothing.

Johnson stumbled along in his armour, sweating and cursing. For him above all, the *Styx* was a place of unknown horror—a black nightmare heightened by the leaden pressure of the suit on his limbs.

"You're sure these suits are O.K., doc?" The rough voice held an undertone of panic.

"You'll just have to take that chance, Johnson," replied Admans, briefly. He trudged on through the darkness, a few paces behind Mayo and Tutin, who were in the lead. Uppermost in his mind was the wish that he could communicate with Mayo without the other two hearing every word. Whatever the liaison officer was planning, he was reduced to the role of a spectator.

They finally reached the engine room. About a dozen Granellas were in the compartment. They waited expectantly, having detected the approach of the men on the armour radio wavelength, to which they were attuned.

"Go on, Mayo!" shouted Johnson. "Tell them what we want them to do and let's get out of here!"

Mayo turned slightly, eyeing the armoured figure and the blaster which menaced him. "You really think it's that simple, don't you?" he said. "O.K., Johnson, you asked for it. Listen to me, Granellas—this is Mayo, your liaison officer, whom you must obey in all things. My orders are that you shall prepare to turn ship and head back to Earth!"

One of the androids detached himself from the group standing round the control panel and approached the men.

"We obey you in all things, Mayo officer—but you know we cannot do this," he said.

"You see, you fool!" Tutin's voice had a ring of triumph. "Now will you believe him? The androids will not turn back."

Johnson moved forward until he stood within a few feet of the towering Granella. "Do as he says—or I'll kill the lot of you," he snarled.

"Men are the masters," said the android. "They have made us to fulfil a purpose—and that we must do."

"Then die, you damned monster!" screamed Johnson.

He pressed the firing lever of the blaster. The android stood unmoved as the flaring energy of the weapon danced around his body. His plexiplast skin was built to withstand radiation ten times the strength of the blaster charge.

"Satisfied, Johnson?" asked Mayo. "These babies are built to take rugged conditions, you know."

The armoured hand holding the blaster sagged momentarily, as the colonist realised his helplessness. In that moment, Tutin attacked. Even in the cumbersome armour, his combat training made him a fast-moving adversary. One hand dealt Johnson a crashing blow that sent him reeling; the other grabbed for the blaster and wrenched it from his grasp.

The admin officer faced the three men, the weapon fanning in a menacing arc.

"Now we can talk intelligently," he barked. He looked down at Johnson, who was struggling to his feet like an ungainly turtle. "First we can dispense with this blundering fool—out here, there will be no need of explanations."

Admans watched in a fascination of horror as the admin officer's grip tightened on the firing lever.

"No! Don't let him kill me, Mayo! Admans! Stop him..." The voice of Johnson ceased abruptly as his helmet disintegrated in a gout of flame.

A wave of nausea enveloped Admans. "You butcher!" he gasped.

"I have my duty to perform," said Tutin. The voice held no emotion. "Johnson was a menace to the success of the project."

Admans felt a sudden, insane desire to laugh. "The

project! Tell him, Mayo, for God's sake. Show our heroic conqueror of the stars what he really is!"

"This is not the place," said Mayo. Ignoring the weapon that menaced him, he started to walk across the engine room, towards the door that led to the android living quarters.

One of the Granellas moved to bar his passage. "Don't worry, Granella," said the liaison officer. "We shall not harm them."

Admans stiffened. "Stop, Mayo!" shouted Tutin.

Admans moved forward. "Do yourself a favour, soldier—listen to somebody else for once," he said, softly. "You've still got the equaliser —what have you got to lose?"

Tutin hesitated for a moment—then he and Admans followed the liaison officer through the door. They walked along the dimly lit corridor.

"Thanks, Mark," said Mayo. "Maybe I was a bit unfair to you when we had that little talk—but I wasn't ready to disclose the full story at that time. The way things are now, I think it's better we should all know where we stand."

Several yards along the corridor they came to a second door. On the floor nearby lay something which reflected the lights of the armoured men. Admans stopped and examined the thing. Made of some sort of plastic material, it had a shape that was vaguely human—but it was a mere shell.

"Don't worry about that," said Mayo, pushing the door open. The medic and the admin officer followed him inside. "You remember I said that the Granellas were something pretty special? That was no exaggeration, as you can see. Goldfarb knew project *Astraventurer* would never establish a colony—so he felt quite justified in planning a project of his own."

Admans looked around at the inhabitants of the room—and found that he had no words. Behind the glass of Mayo's helmet he could see the wide, fanatical, brown eyes.

"But they're too small for

androids," came the voice of Tutin.

"Not for young Granella androids," Mayo said. "Meet your colonists, major. These don't come from the vats—they're born and they grow, like humans."

"That was it, wasn't it?" said Admans, excitedly. "Goldfarb's dream, a breeding strain of androids—the Granellas. They would never have been allowed to live on Earth. But their rigid plexiplast skin—how can they grow encased in that?"

"How do anthropods grow?" said Mayo. "At each stage towards maturity the skin is shed and another grown in its place. You saw one of the husks outside the door. As you say, Goldfarb could never have released the news of such a creation on Earth—reactionary groups would have demanded the destruction of the entire project, possibly even his own death. What he could not give Earth, he decided to offer to the universe."

Admans looked at Tutin. The reactionaries were not confined to Earth. The admin officer's voice grated in his ears. "This is madness—the things must be destroyed!"

"Don't try it, Tutin," said Mayo, urgently. "You couldn't do them any harm with that pea-shooter, but some of the adults might not be willing to take the chance. We had to build survival and protective drives into the Granellas—no self-perpetuating race could get along without them."

"They'll overrun the ship!"

"There's no fear of that," Mayo said. "They are conditioned to work in perfect accord with humans, as long as they remain unmolested. There are nurseries like this all around the *Styx*. Before the *Astraventurer* arrives at her destination, they will be full of members of this new race. A race, incidentally, more fitted for survival than we weak humans. The *human passengers* will live out their sterile lives in comfort—but the colony in the stars will belong to the Granellas."

The three men walked through the *Styx*, back to the artificial warmth and safety of the inner shell.

Admans looked at the two inscrutable armoured backs which moved in front of him. For one, his mission had suddenly ceased; for the other the ages yet to come would see the fulfilment of a dream that was too big for Earth.

. . . In this respect, it is interesting to note that the ships of the 14th Galactic Archælogical Department have found traces of a life form with the characteristics described in this myth. The remains are confined to one remote system on the edge of the galaxy.

It strains all credulity, however, to imagine that such puny creatures could ever play such a role in the conception of our race. Authorities, therefore, dismiss the matter as yet another legend, of no scientific value, except as an interesting psychological manifestation of the need for explaining that which in the last resort must forever remain inexplicable . . .

THE ORIGIN OF MAN,
by Jorin Granella.
Avantor Press.
A.V.6143.

Milestones in Science—3

THE RULE

by H.J.C.

PEOPLE who have studied the matter carefully are all agreed that science in any form ultimately depends upon the measurement of length. This may not at first sight be obvious, but close analysis will show it to be correct. Science, to get anywhere at all, must become concerned not merely with qualitative affairs but with quantitative relations: only these may be expressed with the precision and accuracy demanded by science. Any science, as it progresses, becomes increasingly occupied with establishing relations of quantitative variation. The physical sciences, especially physics itself, have developed this to a very fine degree. It is not enough, for example, merely to discover that objects attract each other. We must know *how much* they attract each other. By tackling this problem, Newton was led to the formulation of the famous inverse square law which has played a most tremendous part in the advance of physics.

And without measurement there can be no examination of quantitative relations. Everybody will probably agree to that without our multiplying examples. What is not so easy to see is that any kind of measurement ultimately reduces to a measurement of length. Let us see if we can make that clear.

Take the operation of weighing. No lengths involved there you think? But your counterbalancing weights are simply a convenient means of expressing the force required to make both pans of the balance stay the same *distance* from the horizontal plane of the balance fulcrum. In the spring balance, of course, the connection with length is even more direct.

Now consider temperature

measurements. When you read the temperature shown by a thermometer, you are merely expressing a *length* of a mercury column in degrees rather than inches or centimetres. Similarly with pressure measurements; the barometer and manometer simply gives us *lengths*—which we happen to have calibrated against known pressures.

There is no way of measuring electricity except by determining the *length* through which the needle of an instrument such as a galvanometer moves. And when you look at a clock, you are seeing a highly conventionalised expression of how much a wheel has moved on its axis.

Take it from us—or the experts if you care to look them up—whenever you measure something, you are measuring a length.

Now we can see how important was the invention of a length measuring instrument. We can find very little information on the early history of the rule. This often happens with the most important—and, therefore, familiar—instruments. We can be certain that length measuring devices were in use at a very early stage in man's history. Notched sticks and knotted ropes in the most ancient human societies. It appears that the Sumerians were the first people to develop a fairly complete system of measuring lengths and translating them into other things. It is from these people that we derive the 12's and 60's, so common in our measurement of time, money, angles, etc.

With the passing of centuries, the length-measuring device was improved to a high degree—something which could not occur until reasonably permanent and unvarying standards became possible. But the "ruler" used in millions of classrooms, drawing offices and studios today, though perhaps now made of plastic, is very little different from the "ruler" that was in use hundreds of years ago. Such persistence of form and popularity testifies to its essential role in the running of any kind of civilisation.

Though man's inherent laziness has induced the design of many complicated instruments for measuring various types of lengths, the humble rule could, at a pinch and with rather more trouble, be used for all such purposes.

Don't despise the rule. Your existence depends on it.

SCIENTISTS CAN BE INHUMAN.
LIKE WHEN THEY TRY TO PUT A—

MAN IN A MAZE

by WILLIAM F. TEMPLE

IF YOU DIP TWENTY-FOUR pairs of rabbits' back legs in liquid air, and twenty-three pairs freeze and fall off, but only one leg of the twenty-fourth pair falls off, what different quality resides in that odd rabbit's leg which causes it still to adhere?

Tyler wondered about it. He made a characteristically neat note in his desk diary to order more rabbits in the morning.

How many rabbits to dip before it happened again? Or maybe it wouldn't happen again. No matter. The importance of an event was usually in ratio to its rarity, and nothing could be rarer than uniqueness. It was one of those ends you had to pull until you got—*something*.

Too late to start pulling now—it was 3 a.m. and he was very tired. He'd let his thoughts play around it idly as he drifted towards sleep. That border on the edge of dreamland was fertile country for any seeds of inspiration. You might bludgeon your brain with reason all day and find no answer, no clue. And then, when you'd given up and retired defeated to bed and the sleep-fog was thickening in your brain, the answer would blossom like a magic flower from your subconscious.

Then you'd have to fight yourself awake and sketch its outline, before it faded, in the bedside notebook. But sometimes you hadn't the strength. And in the morning your only memory was that you'd *had* an inspiration, an idea that might have changed the world. But now it was as surely lost as the lyrics of Sappho.

Tyler opened his bedroom

door and at once forgot about the iconoclastic rabbit's leg. Because beyond the bedroom door wasn't the bedroom—but the bathroom.

His fingers tried to crush the green plastic door knob, then lost strength and began to tremble. Sweat ran from the palm towards their tips.

It was happening again.

During these last unbroken fifteen hours in the lab, absorption in research had temporarily submerged the greater puzzle, which at times lately had driven him near to hysteria.

Now he had to face it again. The inexplicable. The horrible sense of insecurity. The self-distrust. The unresolvable problem: objective or subjective?

Suddenly, his fear was transmuted to anger. This time he wouldn't retreat. It was his job to investigate the mysterious. He'd always sought problems. Why should he run away from this particular one merely because he hadn't sought it? He would outface this thing, master it, solve it, use it.

He went into the bathroom that shouldn't be there.

Everything was real, solid. He turned on the tap to splash his tired eyes with cold water. Then he yelped and snatched his scalded fingers back. Steam rose swiftly from the basin and fogged his startled image in the mirror.

He sucked his fingers. Then, gingerly, he tried the other tap. Yes, the cold water was coming from the tap labelled HOT, and very definitely vice versa.

That was a new one.

He had not eaten all day, else the wash basin would have served for another and more urgent purpose. He felt that bad, suddenly.

He retreated to the passage, tiptoed uncertainly along it as though it had been mined, and reached the branch where the bathroom had been yesterday. Around the corner, the carpet was blue. Yesterday it had been golden. Before that, grass-green. He was almost conditioned to the changes. But not quite. He would never really become used to them until his scientific mind had reached an explanation.

But what explanation? The carpet was an ordinary carpet. He'd examined tufts of it under the binocular microscope. He'd tested them chemically. The only way to make them change colour was to dye them. Dyeing presupposed a dyer. And where, where, *where* was the dyer?

He opened what had been the bathroom door. Behind it was the impossibly spacious lounge, the frozen flowerbed of the Perian carpet, the tall clock with the gold face and the easily swinging pendulum, the long, low easy chairs. The last time he was in the lounge it had been on the floor below.

His head swam, the feeling of nausea returned.

Where was the bedroom hiding from him now? Was it worth chasing around these shifting corridors? No, he was too tired. "Too scared!" mocked the acidulous voice of self-criticism. But his weariness was genuine, and he lapsed into indifference.

He flopped into the nearest armchair without bothering to remove his white laboratory coat, and lay back with closed eyes. Almost at once he heard a distant rumbling, very faint, like far away thunder. It died away. He groaned, and put the back of a hand to his hot forehead.

Again: objective or subjective?

In short, were these hallucinations—or not?

He tried to be logical. If these were hallucinations, then his worst fear looked like being very real—a brain tumour. If they were not, then this house was untenantable—one couldn't live in a maze nor call a single experiment authentic when performed with untrustworthy tools.

In either case he would have to lose his marvellous lab, the best-equipped he'd ever had the use of, relinquish his income—and lose his life. For pure research was his life.

Then he'd never, probably, learn why that particular rabbit's leg refused to fall off . . .

Where was the mysterious Charles Sweet? If Sweet couldn't explain these mysteries, at least he could help by setting up a lab somewhere

else. But Sweet might be anywhere on the face of the globe, and there was no telling where. Sweet was . . . Sweet was . . .

Another hallucination? A character in a dream? He had certainly seemed too good to be true.

He had materialised out of the mist of an early spring night, a big blond man who made the worn chairs in Tyler's apartment seem all too small. He looked forty at first glance. But Tyler soon realised that he was still in his twenties and all that fat wasn't middle-age spread, but the result of a glandular disorder.

He seemed to be wearing a faint twisted smile. He looked at Tyler and winked. Tyler instinctively smiled back. Then understood that his unknown visitor was not all that pleased to see him. The twisted mouth and the twitching eyelid were symptoms of a nervous tic.

"Mr. Tyler, I presume?"

The stranger's voice was weak for such a bulk. It had a rising note to it as though its owner were protesting.

"Yes. You wish to see me?"

"I wouldn't go so far as to say that. I *have* to see you, but I'd rather contemplate the Rokeby Venus."

Tyler froze. "Now, see here, I don't know who you are, but——"

The fat man jammed a card so hard into Tyler's hand that it hurt. "That's who I am."

Despite himself, Tyler looked at the card. It said, tersely: CHARLES SWEET. Mr. Sweet might have been anything from a mortician to a magician, but the card was reticent about his profession. It also refused to divulge his address.

"I've never heard the name," said Tyler.

"I'm not surprised. I made it up."

Tyler stared at him for a moment and then said: "You might have picked a more suitable pseudonym. Now, Mr. Sweet, I don't know what you're selling, but you're wasting both your time and mine. I can't buy anything. I'm a poor man, but a busy one——"

"I can imagine that. There was a lot of work in your paper in the *Journal of In-*

dustrial Sciences on plastic tensions. But what I came to see you about was that anomaly in the refractive indices of resins at certain temperatures. Have you followed that up?"

Tyler was taken aback. "Er—no. I'm sorry, I thought —I had no idea——"

"May I sit down?" said Sweet, sitting down.

"Certainly," said Tyler, belatedly.

"Listen, little man, for your own good don't take offence at my rudeness. It's merely a habit. I've always been rich and able to afford the privilege of being rude. Those who have actively resented it have always regretted it. So don't oppose me. I can do you some good."

"In what way?"

"Why didn't you follow up that resin business?"

"I haven't the necessary equipment."

"Would you like the equipment?"

Tyler hesitated. "Actually, I'm hot on the tail of something else at the moment——"

"You'll never get anywhere, little man, if you try to chase all the hares in all directions at once. Hang on to one tail at a time until you've captured your quarry."

"I know. But I'm always reaching the point where I have to quit practical investigation for theory. Because of lack of equipment."

"I'm offering you all the equipment you'll ever need," said Sweet, irritably, winking twice to the second.

"But why?"

"Let's say I'm a patron of science. That I back little ferrets like you to find out things. It's a good investment."

Tyler didn't like being described as a little ferret nor being addressed as a little man—perhaps because he was a little man.

"I'm not interested in making money for you, Mr. Sweet. My line is pure research for the sake of research. I've told that to a number of industrialists. They said they quite understood and let me have the run of their labs. For a time. Until they discovered that I meant what I said and pursued lines that promised no commercial exploitation whatever. Then they thanked me, fired me, and

blacklisted me—I couldn't get hired anywhere on those terms now."

"Never mind, little man, I'll hire you. I've noted some of your bright ideas and I'm disappointed at the way you let 'em peter out. You keep leaving me up in the air. It's like reading thrillers with the last chapter torn out. Resign from the college tomorrow. I'll send you a monthly cheque sufficient for all your needs, and loan you a house—one I designed myself, centred about the best laboratory you ever saw. You can stay there as long as you like."

"This is—rather breath-taking, Mr. Sweet. What are the conditions?"

"Simply that you prepare full and exact reports on all your experiments and have them ready to show any time I call—which won't be too often."

"Can this be really true?" Tyler asked of himself.

It was true. Amazingly true. The very next day Sweet showed him over the house, set in a quiet and leafy boulevard. It was a three-storey erection, spacious, and perfectly cylindrical. At the heart of it was a tall cylindrical lab, with fine benches of polished wood, gleaming white sinks, glass-fronted shelves of apparatus, power points and gas faucets, electronic gadgets, a projector microscope. It was a research man's Utopia.

Corridors and stairways wound around the outer walls of the lab leading to bedrooms, spare rooms, a lounge, a technical library, a dark room, and enough usual offices to make a house agent's eyes light up.

Each room was equipped with a robot cleaner which sucked the dust away in a few short gulps. Every fitting shone with permanent polish. Heating was electrical. There were self-making beds and electrically drawn window curtains. No housework was necessary. Tyler could devote himself wholly to his own work without interruptions from servants.

"If there's anything you need beyond this for your work, little man," Sweet told him, "ring Parkside 2195—

my agent will have it delivered to you."

A month later, Tyler moved in.

For six months after that he was in heaven. Sometimes he went for a week without shaving, scarcely even eating or sleeping, lured along some magic trail he'd hit on in the woods of science. Sometimes the trail led to a dead end or faded out into the insignificant. But sometimes it led to a fat report to await Mr. Sweet. But Mr. Sweet never came. Nor did Tyler particularly want him to come—yet. Not while things were so interesting.

It was the week when things started to become too interesting that he felt the need for Sweet.

When he noticed that the carpet in the ground floor lobby had changed colour from fawn to a glaring scarlet. It might have changed colour before that, but half the time he lived in reverie and scarcely noticed his surroundings. But that scarlet fairly shrieked at him.

Soon afterwards, he found himself in the lounge after he'd started out to get Tinbergen's *The Study of Instinct* from the library.

This was far from the first time he'd gone absent-mindedly into the wrong room. He tut-tutted, and withdrew. The library was on the top floor, so he tried to go up a floor. This turned out to be impossible simply because he discovered himself to be on the top floor already.

He examined the blank wall where the ascending staircase wasn't, and then craned out of a window and counted the windows beneath.

He counted them thrice. Then his hands trembled on the sill as he leaned on them and gazed at the quiet boulevard below. He couldn't seem to think of anything except how peaceful and normal it was out there, and that he should go out more often.

What was it? Overwork? Hallucinations?

Maybe he'd been overdoing it. The brain plays queer tricks when it's been denied sleep for forty hours.

All the same, a library can't be transformed into a

lounge outside of the Arabian Nights.

Presently, he opened the one-time library door again, cautiously, and when he saw the even ranks of book spines his feelings were mixed. It was nice to have the library back in its niche in space-time, but not so nice to reflect that if the room hadn't wandered then it meant that his mind had.

After that, either things or his mind went on behaving strangely—in spasms.

When, for instance, he pressed the button to draw the lounge curtains and they didn't move but the electric fan started up. That could have been a fault in the wiring, taken by itself. But taken in conjunction with sundry other events . . . It drove him one day to dial Parkside 2195 and ask the agent if he could speak to Mr. Sweet.

"I'm sorry, but Mr. Sweet doesn't reside here."

The agent's voice was cold and impersonal, as always. It occurred to Tyler that he didn't know where the agent resided, nor even his name.

"Well, then, can you give me his address?"

"Mr. Sweet is out of town," said the agent, elliptically.

"When will he be back?"

"I have no idea."

"This week?"

"Maybe. Maybe next week. Maybe next year. I don't know."

"But I must contact him."

" A lot of people want to contact him. If he wishes to contact them, he will do so."

"Then please ask him to contact me. It's important."

"That," said the agent, "is a matter for Mr. Sweet's adjudication."

There was a click as he hung up.

After that there was a complete cessation of phenomena, and Tyler, immensely relieved, began following up the odd events of the rabbit's leg that didn't fall off when dipped in liquid air. This, of course, was a phenomenon in itself, and might be one that couldn't occur outside the confines of this queer house. That was the kind of angle that might drive you mad if you thought about it too much. For how could you

separate the general and the specific if you couldn't experiment anywhere else?

But the incident of the rabbit's leg, isolated in an interval of normality, smelled of a true trail—he knew that smell. Whereas the larger lunacy of interchanging rooms and carpets and so forth was altogether overwhelming—it didn't intrigue him—it frightened him. It was too much. One can only measure abnormality against normality, and when everything around starts becoming abnormal concurrently, then one's little foot rule of a scientific method becomes about as useful as a toothpick.

It was unnerving, then, when he came away tired but content from the lab, puzzling happily about rabbits' legs, and opened a door and walked straight back into this nightmare world of senseless flux—the bedroom that had become the bathroom, and the bathroom that had become the lounge.

He sat in the armchair and thought about it. And the thinking did no good, for the things went on happening after that constantly—stupid things that spoiled his work, that, indeed, made work useless.

He kept 'phoning Parkside 2195 and getting noncommittal answers. Until one day the agent said, abruptly: "Mr. Sweet is on his way to see you."

"When can I expect him?"

But the agent had hung up.

Sweet didn't come until the next day, letting himself in quietly with his own key. He ran Tyler to earth in the lounge. Tyler lay sprawled on the divan, gazing unseeingly at the ceiling.

"Taking a day off, little man? No, don't get up—I'm not of royal blood."

Tyler subsided. Mr. Sweet carefully lowered his bulk into one of the large armchairs. It was a tight fit.

"The reports are in the lab," said Tyler. "But, of course, I can tell you the gist of them."

"Anything promising?"

"The most promising was a line in metallurgy—detecting metals in solution. It's known, for example, that titanium in sulphuric acid produces an

orange colour with hydrogen peroxide. The yellow in that orange can be measured by a colourimeter and so determine the concentration of titanium. But if two grains of manganese be added for each c.c. of acid, there's an effect that doesn't tie in with the chromatic scale as we know it. It points to an entirely new conception of the nature of light—I think."

"You think?"

Tyler looked at him with anguish.

"I *thought*. But now I don't know what to think. Mr. Sweet, what is the colour of the carpet in the passage outside?"

Sweet regarded him thoughtfully, pulling his lower lip about and making his mouth look presentable—it must have been a life-long habit.

"Please look and tell me. Really, it's important."

Sweet shrugged. "If you say so." Grunting and breathing hard, he extricated himself from the chair and went to look outside the door.

"I'd say it was fawn," he said, returning. "So what?"

"This morning it appeared to me to be a pale green," said Tyler, in a low, flat voice.

"*What?*"

"It has been scarlet sometimes. And other colours."

Sweet just stared at him, his eyelid flickering like a semaphore.

"That's why I couldn't continue with the light and colour experiments," said Tyler. "I can't trust my eyes any more. It could be some physical degeneration in the foveal area of my retinæ, causing the cone-shaped cells to lose their proper form."

"Then why don't you go see an oculist, little man?"

"Because he couldn't tell me why a gramme weight on the pan of my chemical balance should suddenly start to weigh two grammes. Nor why a score of such lunatic things happen. Oh, it's beyond bearing!"

Tyler's self-control broke. He gave a deep sob, and then lay back on the divan with his eyes closed. He lay very still.

Presently: "When you're through playing Sleeping Beauty, though miscast for

the role, you might be a bit more explicit," said Sweet, without sympathy. "But you'd better hurry—my time is limited."

Tyler pulled himself together, and told miserably of all the things that had gone wrong. Sweet insisted on a tour of the scenes of the incidents, and everything—with one exception—appeared to be normal. The curtain button worked the curtains and not the fan, and all the rooms stayed put, and the right water came from the right taps.

But when they entered the laboratory Tyler shivered.

"Something's gone wrong with the heating now," he muttered. "It's freezing in here."

Sweet looked surprised. "I don't notice it."

"No?" Tyler felt another of those horrible little qualms. He looked at the wall thermometer. Sixty-five degrees Fahrenheit it said—and that was the house temperature that the thermo-couple was supposed to maintain.

"It seems to be me," said Tyler, wretchedly. "But I still think if you stick around something will happen that you can detect, too. I could use an independent witness."

"I'm afraid I must go soon," said Sweet, glancing casually around the lab.

"But I must have someone else with me when these things happen, to put the matter beyond doubt one way or the other. Am I ill—or are things really happening?"

"Surely the best thing is to see a doctor?"

"Yes, I suppose so. But if only someone could stay with me. My only real friend is in Italy just now. I don't know who to ask."

"Ask no one," said Sweet, brutally. "This is my house. It's not an hotel."

"Could I have a servant, then?"

"What on earth for? This house was especially designed to do without bothersome servants. No, little man. If you don't like this house the way I like to have it, then you'd better start packing."

"Have you another lab anywhere I could work in, Mr. Sweet?"

Sweet made a noise like a neighing horse. His weak voice cracked on a note of indignation. "Stop trying to cross-examine me, little man. My affairs are my affairs. At the moment, your affairs are also my affairs. If you no longer feel capable of doing serious research work, then you're wasting my time and apparatus. You'd better leave. I can find another protege."

"But where could I go? Someone has taken over my old job, and at my age——"

"That," said Sweet, "is one affair that *is* your affair."

A spark of anger suddenly blazed in Tyler. "You made me give up my job. You brought me here. You promised that I could stay as long as I liked——"

"Sure. But on condition that you prepare me proper reports of your experiments. Can I help it if your observation begins to fail and your data and deductions must, therefore, always be suspect? We shall get nowhere like that."

"Okay," said Tyler, decisively. "I'll see a brain specialist right away. If he clears me, will you accept his verdict and let me stay on?"

"Of course. Always provided you continue to make out reports that add up to sense. Goodbye, Mr. Tyler."

When Sweet had gone, Tyler looked up the number of Bleiker, the brain specialist. He dialed it on the 'phone in the lab. He heard the buzz-buzz of Bleiker's 'phone ringing, and then it stopped.

"Hello—Mr. Bleiker?" he asked, tentatively.

A tinny voice replied: "Hello—Mr. Bleiker?"

He wondered briefly at the inflection of inquiry, then said: "I should like to make an appointment."

The tinny voice said: "I should like to make an appointment."

Tyler went tense, and his fear begat anger. "Get off the line!"

"Get off the line!" came back rudely.

Tyler slammed the receiver back on the rest. It was still freezing in the lab but sweat started to prickle on his scalp. He hadn't recognised the telephone voice as his own,

but it was clear now that it was.

The careful experimenter took over for a moment. He dialed the number again.

"Hello, who's that?" parroted his own voice.

He pushed the rest down, thought a moment, then dialed Parkside 2195.

"Is that Mr. Sweet's agent?" his own voice asked of him.

He almost ran out of the house. He went to a bar and had a couple of double Scotches, neat. Then he used the bar 'phone to fix the appointment with Bleiker for four o'clock that afternoon. He walked the streets for hours until four.

"Well, Mr. Tyler," said Bleiker, on his entry to the consulting room, "what seems to be the trouble with you? Please sit down."

"Could be a brain tumour," said Tyler, sitting.

"What makes you think so?"

"Auditory and visual illusions."

"Let's start with the auditory illusions. What form do they take?"

"I sometimes hear rumblings like a distant thunderstorm, when there is no storm. I have heard—a voice."

Bleiker stroked his nose thoughtfully. "The rumbling noises are a common delusion with brain tumours," he said. "The voice—not so common. What about the visual side of it?"

Tyler told him, in detail. Bleiker had narrow grey eyes, but long before Tyler had finished they were as round as hoops.

"Amazing!" he exclaimed. "Never heard anything like it in my life, outside of delirium tremens cases. But I can see you're not an alcoholic. Auditory, visual, and tactile illusions. Smacks of opium."

"I assure you——" began Tyler.

"Okay, Mr. Tyler, that's not my business. I'm concerned only with the physical condition of your brain. Do you have bad headaches?"

"Occasionally."

"Lately?"

"No."

"Any physical sickness—retching?"

"A couple of times, recently."

"Giddiness?"

Tyler smiled wanly. "When you've seen some of the things I've seen happen, you can't help your head spinning."

"I see." Bleiker reached for his ophthalmoscope. "Let me examine your eyes . . ."

When he had finished, he frowned. "Well, I can set your mind at rest about a tumour, Mr. Tyler—you haven't one."

"How can you tell?"

"No papillitis. That means blood choking the aperture at the back of the eye."

"The papilla?"

"Yes. The pressure of a growth in the brain forces the blood into the papilla. Not all cases of papillitis are caused by a tumour, but a tumour is always accompanied by papillitis. That symptom, plus those of violent headaches, giddiness, and retching always add up to a tumour. You haven't papillitis at all, and the other symptoms only slightly. *Ergo*, no tumour. We shall have to look somewhere else. I propose to take an encephalograph of the alpha wave rhythms of your brain . . ."

Bleiker did that and a lot more things before he convinced himself that Tyler was a liar, conscious or unconscious.

Then he said, irritably: "I can find nothing wrong with your brain, Mr. Tyler. If the delusions continue, then I advise you to see a qualified psychiatrist. What is your full name and address?"

Tyler told him, asked for and got a certificate of clearance, and left. He knew the bill would be pretty heavy. He would have to save for it.

On the way home he bought a cheap thermometer. Scepticism of the instrument was a constant rule of the research worker, and he didn't trust the thermometer in the lab. It was nice to be able again to distrust something outside his own mind, and revive the hope that these improbable happenings had a material explanation. After all, if the reports were to be believed, there were a couple of places in the world where the laws of gravity seemed to be rather bent—where you had to accelerate to drive a car downhill and where water

flowed uphill. Perhaps Sweet's house had been built upon some such kind of odd spot. Where time might slip a cog sometimes and you would hear your own voice repeating itself. Where temperature fluctuated irrespective of the weather.

Maybe he should write an article about it . . .

When he re-entered the lab it was no longer cold there. When he compared the two thermometers they agreed that the temperature was sixty-five degrees Fahrenheit.

Perhaps it signalled a return to normality. He took out Bleiker's certificate, read it again, and then put it away, feeling cheered. He even whistled as he took up the threads of an unfinished experiment concerning precipitates. When he tried to light the Bunsen burner, the gas which hissed out wouldn't light, but the burning match flared up like a torch.

Pure oxygen was coming through the gas pipe. Or seemed to be . . .

He groaned. There was to be no end to it, after all.

Forty-eight miserable hours later he gave up fighting it. The will had deserted him. His nerve was broken. While just a fragment of it remained, he reached for the jar labelled potassium cyanide and tipped a sizeable amount of the white salt into a beaker of water, stirred it, dissolved it.

He took a last look around the lab with which he was no longer able to cope. He could not live either in it or outside it now. The future offered the choice of helpless and friendless poverty—or of a breakdown near to insanity. Or perhaps both. Further serious research work was impossible, anyhow, and life was nothing without it.

Bleiker's certificate was useless. It would not enable him to prepare one report for Sweet that could follow a coherent line of thought.

And what competent psychiatrist would certify that he was in his right mind?

He was done, defeated.

He gulped down the beaker of liquid.

The reaction was almost immediate. Salt water is an excellent emetic.

While he was heaving, a section of the glass-fronted shelving opened slowly like a door and the unsightly Mr. Sweet lumbered from concealment. Not only his face but his whole body also was twitching with excitement. He advanced until he faced Tyler across the bench.

"I have come to gloat, little man."

Tyler leaned against his side of the bench, trembling and feeling very ill. He wiped his mouth with a handkerchief.

"Are you behind this?" he whispered.

"Yes." It was a triumphant little squeak of victory. "I didn't really think you'd go so far as suicide, but I allowed for it, none the less. You can't gas yourself with oxygen. You can't poison yourself with common table salt."

"What did I ever do to you?" Tyler asked, wearily. He was drained even of the will to be bitter.

"You murdered me, that's all. Stole my life." Sweet had all the bitterness Tyler lacked, and more. He spat hate across the bench. "Scientists!" he said. "*Scientists!* Devils! I'd like to wipe out the whole brood of them."

Tyler summoned a touch of dignity. He said, quietly: "If you've chosen me to represent the class, I'm flattered. But I'm only a humble worker in the cause."

"The cause!" jeered Sweet. "You call your mumbo-jumbo tricks a cause? You and your kind have never risen above the level of a tribal witch doctor. Most of you are devoid of imagination. You just copy each others' tricks. Some fool puts a rat in a maze with its food at the other end, lets it learn the path to its food by trial and error, and then keeps changing the layout until the poor creature is baffled into helplessness and is frightened to move at all. Right, he's proved something—that you can torture a rat into a nervous breakdown. All the rest of you keep doing it over and over again, to see who can drive the most rats mad the fastest. Then some genius gets the idea of trying it on guinea-pigs, dogs, cats, mon-

keys—I suppose you'll not be satisfied until you've got human beings penned in your damned mazes. Well, I anticipated that. I put *you* in a maze first—the biter bit. Now I can claim to have discovered that the same methods will drive human beings to attempt suicide. Maybe my name will go down in scientific history."

"What did I ever do to you?" Tyler asked again.

Sweet ignored the question. He went on, spitefully: "I baited you with your dream laboratory. That was your food, the sustenance you needed for your kind of life. For your work is your life, whatever it means to other people's lives. Then I made it useless to you, until *you* were frightened to move—you'd learn to distrust every tool of your trade, including your own senses.

"You were living in a real maze here, little man, full of secret ways and spy-holes. I could watch you in every room. I could roll up and replace lengths of carpet when you were asleep or wrapped up in your idiotic experiments. And switch the water pipes and gas pipes behind the wainscoting where you couldn't trace them. Switch the wiring, too. Best of all, switch the rooms. Ingenious, this house. Cylindrical, so that all the rooms can slide round the stationary pivot of this lab. But they're also separate units which can be made to glide, elevate, and interlock as smoothly and indetectably as the parts of a puzzle box. Almost indetectably, anyhow. Sometimes the rollers rumble a bit. You probably put it down to head noises."

Tyler remained silent, staring at him.

"Oh, I thought up scores of tricks. For instance, your chemical weights. They're copper, but they each sheathe a steel ball bearing. Under this bench top"—Sweet tapped it—"there's fitted an electromagnet, remotely controlled. Need I elucidate further? Behind the walls here—a refrigerating plant. I could turn this whole room into a deep freeze—inconvenient if you're dealing with relative temperatures, huh? That wall

thermometer? Forget it. It's fixed—can't show anything else but sixty-five degrees. You really amused me with the telephone. It's a perfectly ordinary 'phone, but it can be connected to a wire recorder which automatically plays back anything you say to it. I'm afraid my agent often lied when he said I was out of town. I was just as often behind the walls watching you. Not all the time. I have to eat and sleep. I have my own ways in and out of this place—remember, I built it."

"Just for me?"

"Just for you, little man, my pet, my life-long enemy."

"What have I ever——"

"I'll tell you. It goes back a quarter of a century, to Pavlov's happy days, and when Dr. J. B. Watson was founding the Behaviourist school. Remember his fear conditioning experiments with a baby—Albert? Watson kept striking a heavy steel bar just behind the baby's head until Albert was scared and crying—he was only eleven months old. Having established his terror of the noise, Watson kept striking the bar every time Albert tried to play with his pet, a white rat he loved. The fear reflex was transferred to the rat. And so Albert lost his little friend—he became terrified, not only of white rats, but also of rabbits, cats, dogs and anything of a furry nature, including sealskin coats, cotton wool, and even the hair on Watson's head. You copied those experiments, didn't you, little man?"

"I—er—did some work of the sort."

"You copied them on *me*. Charles Weir my name was then, and I was not a year old. You charged my whole nervous system with fear of this and of that. You made me the nervous wreck I've since always been. I don't know what happened to Albert, nor what he felt about it, but I know what happened to me and how I feel about it. What have you ever done to me, you ask. I ask—what had an innocent baby ever done to you?"

Sweet was white and shaking with anger. There was a rim of saliva on his twisted lips.

Tyler shrank back. He was in a narrow cul-de-sac formed by the bench and two walls. His eyes flickered about trying to assess the chances of escape.

Sweet took a deep breath and tried to calm himself.

"You were playing along with another crank of your kind at the time," he went on. "His name was Sparks. He died before I could get hold of him, but I got his papers—his precious 'reports.' Lord, how you people document these evidences of your crack-brainedness! There were two hundred sheets concerned with how he trained cats to pull boxes along by strings!"

Sweet put on a childish mimicking voice. "'Tibs pulled the box 33 centimetres due north, then paused to wash. With her leg (left, rear) cocked at an angle of 80 degrees to the floor, she seemed to think (time, nine seconds), then pulled the box another 27 centimetres in a south-westerly direction . . .' That sort of thing. Note every detail—it might be important. Note every detail—but don't notice that horses have been pulling carts for hundreds of years, or what goes on at a flea circus—or any circus. Scientists!"

The fat man spat.

Then continued: "From further reams of Sparks' lucubrations I learned how he and you persuaded my rich and foolish father to let you experiment on me for the good of science. In particular, how you monkeyed with my parathyroids and upset the whole chemistry of my body, so that I became gross and ridden by tremors, an object for pity—or ridicule. Yet I had been a well-formed child . . ."

He trailed off, looking into space.

Then, suddenly, he snapped: "Oh, what the hell use would it be trying to make you understand 'the pangs of despised love'? There was a girl I broke my heart over. She was even wealthier than I—I couldn't buy her. She didn't laugh at me. She was sorry for me. But not all that sorry. My condition repelled her. It repels all women. And, heaven help me, women are *my* life! I buy and buy—but I

never really possess women. They suffer me, at a price. In short, you murdered me."

There was a pause.

Then Tyler said, hesitantly: "I'm truly sorry. I meant well. The things Sparks and I conditioned you to fear were dangerous things which might have harmed you. Perhaps we overdid it. As for the glands—I still don't know what went wrong there. We were trying to lengthen your life."

Sweet snorted. "Lengthen it—you took it, you blundering fool! Why can't your sort leave things alone?"

"We only try, for the good of us all, to learn what it's all about."

"So you cut open the guts of living dogs to see again what you've already seen a thousand times. You play these imbecilic games with rats and mice and rabbits' legs—what fool trick were you playing with those rabbits' legs? I watched you. What were you trying to learn 'for the good of us all,' little man?"

"I don't know. Something might have come of it."

"Rabbits' legs?" sneered Sweet.

"Why not? Remember the twitching frogs' legs—and Galvani. That brought the discovery of electricity. Remember the tiny patch of mould Fleming became curious about—and discovered penicillin."

"And remember Watt and the boiling kettle!" jeered Sweet loudly. "Galvani, Fleming, Watt—they didn't rob a baby of its birthright. But *you* did." He thumped the bench heavily. "What you did to me can't be defended——"

An ill-balanced jar of yellowish fluid was shaken off its high glass shelf by the thump. It fell like a bomb onto another jar standing on the bench which held a brownish-red liquid. Both jars shattered. And liquid fire spurted and ran—aniline and fuming nitric acid make a flaming union, always.

Tyler's clothes were splashed. They caught. He screamed and tried to run out of the cul-de-sac. A moving hedge of fire hemmed him in. He ran back and forth, trapped, tortured.

Sweet stood with mouth twistedly agape, eyes staring. His arms were held out before him, fingers clawing to get at Tyler and pull him out of it. But his body would not advance. He seemed to be straining against invisible bonds.

He spoke, chokingly. "I didn't mean—— Oh, God, *fire!* You made me afraid of fire!"

Yet still he tried to face it. But what was happening beyond the fire he soon could no longer face.

With a thin wail he turned and lumbered to the 'phone.

"Operator! Help! Get the Fire Department . . ."

A click, and then a tinny voice echoed mockingly: "*Operator! Help! Get the Fire Department* . . ."

A phrase he'd used but ten minutes ago came back to him: "The biter bit!"

The wooden shelves crackled as they burned, and the smell of burnt paint was pungent. There was another horrible burning smell, also . . . A heavy drift of black smoke moved slowly behind the bench. It seemed to scream as it moved. A voice from a cloud . . .

Sweet, with an effort, turned his red and streaming eyes away from it. He dropped the 'phone, and groped to the door and through. The smoke and the smell pursued him along the passage.

Was he going the right way? Had he turned the right way? He tried to get the latest layout of the house clear in his mind. But nothing would come clear in his mind. For it was full of fear and horror, anguish and remorse, dancing wildly, and a lipless voice that shouted over and over: "Get out of here! Get out of here!"

But where was the way out? There were doors, endless doors. He pushed and pulled at them, but freedom never lay beyond. The corridors were curving ever further round the circle of the house. He must be nearing his starting point. Behind every door now was the threat of—*fire*. No longer could he bring himself to thrust at them, lest one opened into the hell of that laboratory.

It was his turn now. He was

the man in the maze. And the price of not finding the way was death.

Then, suddenly, the passage darted away to the right, and there was a glass door and soft daylight beyond. He covered his face with his arms and crashed through into fresh, smokeless air.

He was near collapse, his legs weak as straws. He wanted the feel of something solid to cling to, something that wasn't a trick, something that wouldn't fool him and change its location in the scheme of things. An anchor.

He was crying like a child, and the tears blurred everything. He blundered into something and grabbed it. This was what he sought. He hugged it, and the blood from his cut fingers trickled down the bole of the tree.

The house crepitated behind him. But he was safe out here so long as he didn't let go. A tree has roots—deep roots.

He clung there, timelessly.

Presently he was dully aware that people were moving around him, talking to him, trying to persuade him to let go. Of course, they were trying to persuade him back into the house. How they lied and cajoled!

"Let us take you home," they said.

People! As if anyone could ever trust people! They only want to use you for experiments.

He would never, never let go of that tree.

Distantly, through the golden evening air, came the clang and siren of a fire engine.

The MOON BASE

From a model by Morris Scott Dollens.
Scene from the film *Far Horizons.*

Photos.: Ackerman Science Fiction Agency

ONE DAY MAN WILL HAVE A BASE on the Moon. You would be hard put to it to find a scientist who would disagree with that statement. About the only point of disagreement is *when* we shall get there. But for the moment let us ignore that side of things, and consider what we shall do when we *are* on the Moon. We shall find that a great deal of work has already been done on this matter.

It is assumed, of course, that several preliminary survey trips will be made before we actually land on the Moon. These will be mainly concerned with finding a suitable site for the base. Though we know a lot about the Moon's face from our terrestrial observations, nothing but good can come of taking a closer look and being sure that the base is built in a position of advantage. Points to be considered here are nearness to Earth, protection from meteors, workability of the terrain from the aspect of mining, and so on.

By the time all this has been done we shall probably have an artificial satellite in the sky, and this will be invaluable in the setting up of a lunar base. It will be a sort of half-way station. Quite likely, the ships that still actually land on the Moon will be built out in space from parts ferried up to the space station. A ship that runs from station to Moon requires considerably less fuel than one which goes straight from Earth. The latter will require a lot of fuel to overcome Earth's gravity, whereas the former will not.

It is also likely that a smaller artificial satellite will be made to circle the Moon itself. This will serve for the accumulation of equipment, brought up during several trips, so that it may all be on hand when construction work begins.

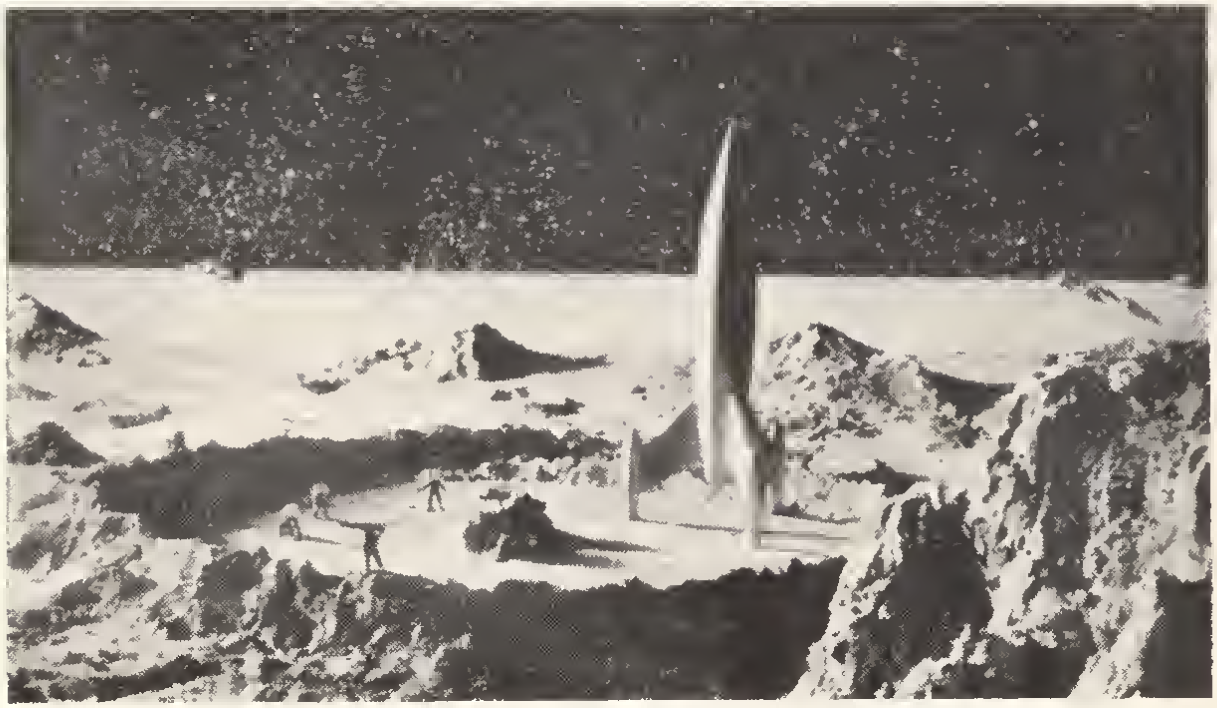
Then will come the great day when the first ship touches down. Man's first step on an alien world! But there will be little glamour in early life on our hard, cold satellite. To begin with, no doubt, the spacemen will set up a temporary dome in which they can take off their space suits and relax at the end of their toil. For toil it will be. Hours and days and weeks and months of it. No pioneer on Earth ever worked as hard as these men on the Moon will have to.

The dome will not be suitable for very long. Some kind of permanent quarters will have to be made. These may well be scooped out of the rocks that abound on the Moon. With luck, there will be mechanical scoops to do the job, powered in some way that does not need oxygen, for any oxygen taken to the Moon will be needed to keep the men alive. Unless they find water.

Now it is almost an axiom of science fiction that there is no water on the Moon. But scientifically this can only be interpreted in a broad fashion. Certainly there are no lakes and seas, and no water vapour above the surface like the thick belts of cloud around Earth. However, it is thought that since the temperature in shady places on the Moon may well be always in the region of −40° C., there may well be ice in some of the deeper crevasses. At that temperature the vapour pressure of ice is so low that evaporation can be considered to be negligible. Thus, if there *is* ice on the Moon, in situations where it can be got at, the spacemen can make oxygen and hydrogen from it by electrolysis. It is almost certain, too, that there will be water in some form trapped in the rocks, combined in some way with the minerals.

This is all very fortunate because as the men dig out the enormous cave that will house the completed base, the dug-out rock can be smashed up and its water extracted, giving hydrogen for fuel and oxygen for spacesuits. At least, that's the theory! The amount of power needed for electrolysing a useful amount of water has been estimated to require 5,000 tonnes of electrical cells, but there is no theoretical reason why this amount should not be ferried up before the operations begin.

All in all, though, it can be seen that the biggest problem facing the constructors on a lunar base will be power. Nothing can be done without the expenditure of energy; further, not much can be done without the expenditure of a *lot* of energy. Most of the energy-conversion processes on Earth are extremely wasteful; for example, only 10% of the electricity that flows through your meter appears as light in the bulb. The rest goes as heat, which you don't want but have to pay for all the same! So it is with many other things. The amount of work we get out of a system is always very much less than the amount of energy we put in. On Earth we can afford to be wasteful like this. On the Moon we can't.



Though a lot can be done with

cells, either batteries or photocells and thermocouples, these would only be able to supply the power needed in the very early stages when operations are still being conducted on a relatively small scale. Once the base gets really under way—or, rather, *before* the base can get really under way—some more efficient source of power will have to be found. You probably don't need to be told what this will be—atomic power.

It seems pretty certain that space travel as a whole, and the lunar base in particular, will have to mark time until the physicists have produced a light, portable atomic power plant. This is by no means easy and may well take a couple of decades of research and experimentation. But it *will* come. And then there will be nothing to worry about. A mere fistful of matter will produce enough power to run the Moon base for a couple of years!

So far we have spoken only of the physical side of the lunar base, but there are other, more human questions involved, too. Such as food.

It may or may not be true that armies march on their stomachs, but it is certain that men are not going to be able to carve a niche on the Moon unless they receive good nourishment. The work will be back-breaking and the mental strain tremendous. Good food will play a big part in keeping them going. Thus, we may readily assume that at least the first few supply ships will carry some of the finest food on Earth, carefully balanced in calorie content, and at the same time attractive enough to help the men forget the bleakness of their surroundings. None of those horrible pills and tablets for these cave men!

But, of course, that can't go on. The lunar base, to be a success, will have to become self-supporting, or largely so. That is where the modern science of hydroponics comes in. The Moon is ideally situated for growing plants by this method—which requires no soil but only water, salts and sunlight. Water, we have seen, can probably be obtained in fairly large quantities once the mining operations are in full swing and the atomic power plant is available. From the same operations, mineral salts can be obtained, with perhaps just a few missing ones brought up from Earth in very small quantities. Of sunlight there is plenty, with no atmosphere and clouds to obscure it.

There is also plenty of space for the laying out of vast, shallow tanks, protected against the vacuum of space by air-tight coverings. In these can be grown a wide variety of plants with very little attention and in great abundance. So much for the vegetables. What about good red meat?

This will be a little more difficult, but it can be done. There will have to be constructed some kind of a compound in which cattle, sheep and pigs can be kept. These will be fed on the vegetable waste and on specially-grown hydroponic fodder. It may even be possible to let them graze in an enormous hydroponic "meadow," the plants making enough oxygen for the animals' requirements. But that would need a bit of working out!

There can be no doubt that there will be many difficulties and unforeseen snags cropping up when the lunar base begins to be constructed. But the point that emerges from all the work that has been done on the problem is that there is no theoretical objection to the project. Indeed, a careful examination of all the known facts suggests that the task may well be easier than one might at first imagine—this matter of the availability of water, for example.

While it would be foolish to look upon the project as "a piece of cake," it would be equally foolish to think that it could not be done. The number of highly qualified scientists who are day by day working out the details testifies to the certainty that man will reach the Moon and live there. Whether he will like it once he gets there is another matter!

When the Flying Saucers land

will *you* be ready?

ONE DAY WE WILL DISCOVER THAT we are not alone.

One day the ships from space will land, thousands of them, driving down from the void and making planetfall in our own backyard. We shouldn't be surprised when they do. We have had hints enough, mysterious lights seen in the skies, strange, inexplicable shapes seen by watchers, spotted by aircraft, vouched for by thousands of observers and disinterested witnesses. You have heard of them as has everyone in the civilised world. We call them "flying saucers" and ignore them as a joke, a hoax, or as something invented to titivate the appetite for sensation.

But perhaps the crews of those saucers are watching, examining, testing perhaps the world which we have always considered to be particularly our own. They hover in their vessels, not intruding, vanishing when seen, silent, enigmatic visitors from an unknown world, content apparently to merely observe and wait.

Wait for what?

For their main fleet, perhaps? For the peoples of their own planet? We do not know. We can only surmise, and as our experience is limited, we must extrapolate on the basis of what we ourselves would do had we contacted another world.

We would observe it, of course, making the essential tests of air and water, soil and radiation, watching the native peoples and learning from what we saw. Then, when we had determined whether or not the planet was suited to us, we would send back word and wait for the main body.

And the natives of the planet need not even suspect what was about to happen.

Until the ships landed and they found that they were not alone.

It could happen to us. What would we do? First, of course, there would

be a period of sheer incredulity. The majority of the population would simply refuse to admit that there could be such a thing as extra-terrestrial visitors, and would dismiss the whole thing as an elaborate hoax. Conviction would come soon after, the sight of the landed vessels and their crews would become commonplace, and inevitably each nation would look to its arms.

That would come first, before any attempt at contact had been made, for man is a victim of his own fear and to him the inexplicable and strange is always dangerous. So the armies would be mobilised, the fleets warned, the squadrons alerted and the menacing mouths of cannon would greet our visitors from space.

Then would come the negotiations.

They would have learned our language—learned, rather, the tongue of each country, and, as intelligent and civilised beings, would be first tolerantly amused then utterly disgusted at our methods. Each nation would seek to gain the advantage over every other country. They would bargain, haggle, plead, warn and misrepresent. They would question and, since our motivations are so often dictated by fear, they would probably beg with one hand on a gun and their promises would be tinged with threats. At this early stage the indoctrination of years could not be forgotten, and negotiations would be conducted with but one thought in mind——

To get what we could and beat the other fellow any way we can.

That stage would be passed when we learned that the aliens had their own ideas and did not intend to give us their science for the asking. They would have arrived in force, not to give us better ways of killing ourselves, but to establish themselves here permanently as an extension of their Stellar Empire or, as far more likely, to help and guide us on our long road from primitive animal to civilised human.

And then the nations of the world would band together against a common enemy.

For they would be enemies. Anything which tries to alter the scheme of things is considered to be a threat, and must be treated accordingly. We are arrogant creatures, with a supreme conviction that of all living things, we are the master. That arrogance has lifted us from the mud and slime, and set our foot on the path towards the stars. Nothing is better than we are—nothing, not even our fellow men, and to prove it we would drench the world

in blood. We will fight for the right to go to hell in our own sweet way, and if anyone tries to stop us, then we will take time off from race suicide to kill them first.

And so there will be war, bitter, savage, but futile. A war which we shall have lost before we even began, for we will be in the position of savages hurling spears at armoured men armed with machine guns, and the end will be the same: utter, humiliating defeat, and we shall be forced to admit the aliens' superiority.

Then will dawn the new era.

We shall no longer be in the position of a small tribe hidden in the jungle. We shall have become part of a vast federation in which we have our rights and our duties, and, as guiding mentors and watchful guardians, the aliens will dominate our world.

There will be no thought of conquest. The aliens will have come as missionaries, as benevolent dictators, willing and eager to help us, warm with friendship and the desire to do good. Their very intelligence will be our safeguard against exploitation and degradation. They will regard us as wayward children, too long isolated and playing with toys too dangerous for our own safety. They will embark on a programme designed to benefit us in every way, and they will be determined to carry that programme out. They will be idealists, knowing that their way is the right way, friendly towards us and wishing only to do us good.

They will be the most dangerous enemies we could possibly find.

For what defence is there against a friend? Especially a friend who insists that we do as he says because it will benefit us—and has the force to make that insistence stick. The majority of civilised men and women smoke, inhaling nicotine-laden fumes, and nicotine is a poison. Smoking, therefore, is a stupid, illogical, detrimental thing to do and does us nothing but harm. Stop the manufacture and sale of tobacco.

Drinking is another form of self-poisoning. Alcohol is foreign to the metabolism; it slows reflexes, dulls the intelligence, weakens the censor and can lead to serious internal diseases. Stop the manufacture and consumption of all alcoholic drinks.

Our streets are death-traps, filled with vehicles travelling too fast for safety and filling the air with poisonous carbon monoxide fumes. Open fires emit carbon and sulphuric vapours and cause fog and bronchial troubles. Stop the use of cars and prohibit all open fires.

The cinema leads to discontent by showing an unreal world of luxury and make-believe. The radio and television waste precious time which could be spent in education and enlargement of mental horizons. It would be better not to have entertainment, and so force the people to turn to creative pastimes.

And so on . . . and so on . . .

How long would it be before we lived in a world almost totally different to the one we know? A world run entirely on electricity generated by atomic power. A world in which narcotics and euphorics were unobtainable, a planet without a cinema,

a pub, a tobacco kiosk, without light reading, commercial entertainment, illogical sports or any of the time-wasting pursuits we now have. Some things would have their advantages; guns and armies would become obsolete as the world began to lose its boundaries and nationalistic pride. Within two generations, three at most, Earth would have changed and the race of man changed with it.

Unless . . .

Unless we fought to retain our basic rights. Unless our arrogance prevented us from accepting the friendship of the too-sane aliens. For there are more ways than one of uniting the world against a common enemy. It needn't take the threat of planetary invasion to bring different races and creeds together in the face of common danger. Interference with personal liberty can have the same effect, and as our accustomed pleasures began to vanish by order of our "friends" we would fight to retain them.

And we would fight in the only way we knew how.

Desperately, insanely, refusing to admit when we were beaten, taking ridiculous chances and running stupid risks in order to continue poisoning our own bodies—if we so wished. The right to kill ourselves in too-heavy traffic, to sit over a smoking fire, to drink tea or other stimulants, to waste our own time in our own way.

Not with weapons, of course—there would be no weapons—but with passive resistance, dumb insolence, stubborn refusal to do what is best for us, ignoring the directives, and driving our "friends" into perplexity at our illogical behaviour.

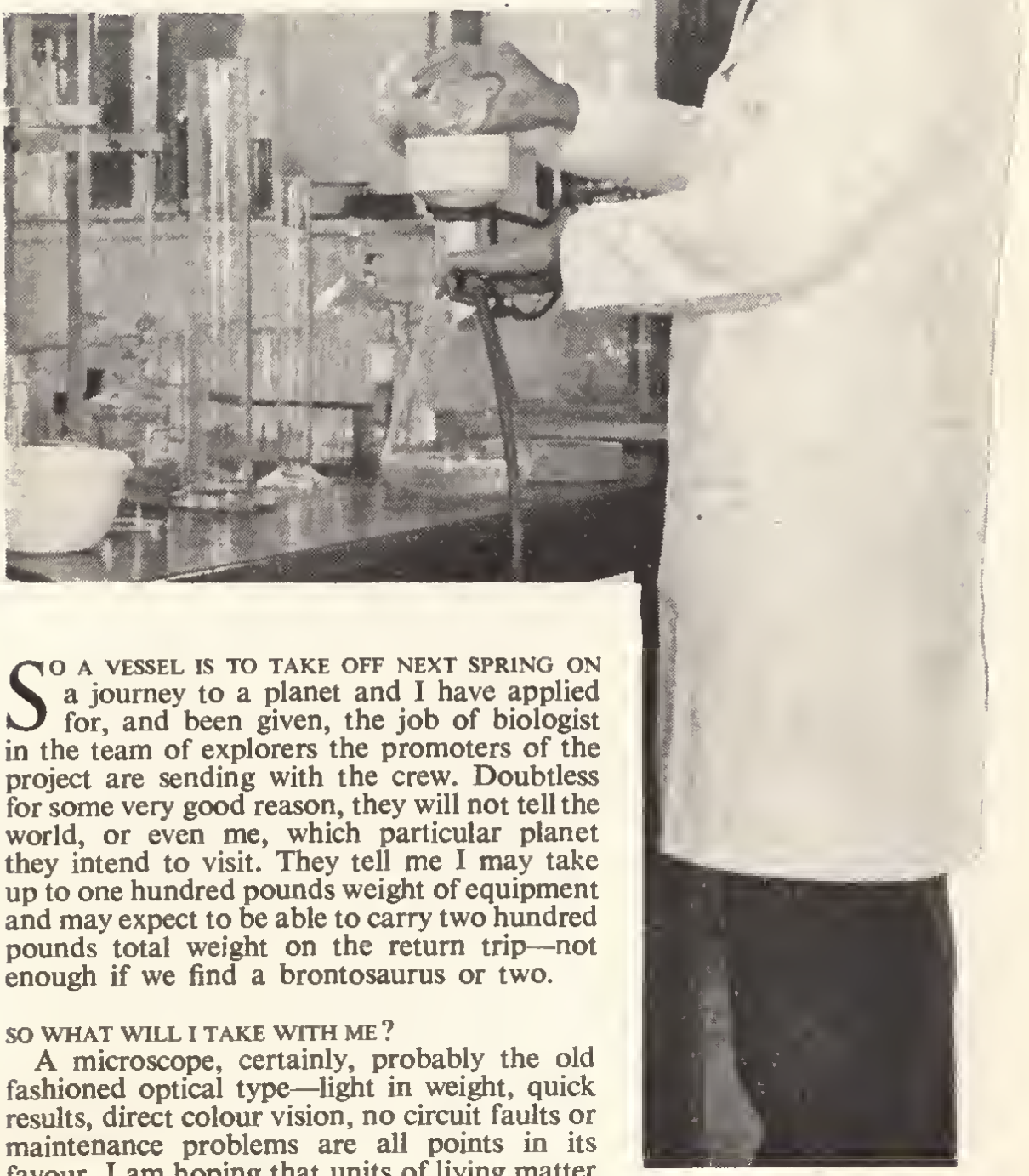
Perhaps they would give up then, admit defeat and let us go our own way. Perhaps they would use harsher measures, grieving at what they did, but determined to save us if they had to kill us to do it. Perhaps we, by our unity, would have done the very thing which could possibly save us from extinction and, their mission accomplished, they would return to their own world.

Or, perhaps, they would just give us up as hopeless, a race suffering from incurable insanity.

And perhaps they would be right.

PLANETARY EXPLORATION

2 . . The Biologist



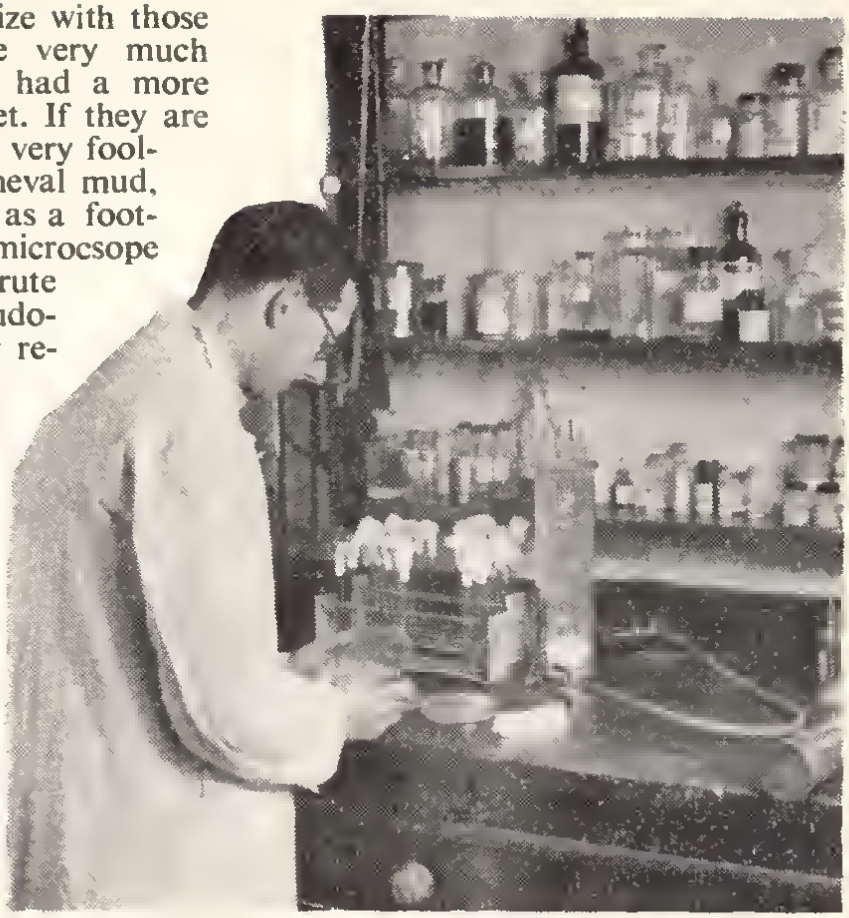
SO A VESSEL IS TO TAKE OFF NEXT SPRING ON a journey to a planet and I have applied for, and been given, the job of biologist in the team of explorers the promoters of the project are sending with the crew. Doubtless for some very good reason, they will not tell the world, or even me, which particular planet they intend to visit. They tell me I may take up to one hundred pounds weight of equipment and may expect to be able to carry two hundred pounds total weight on the return trip—not enough if we find a brontosaurus or two.

SO WHAT WILL I TAKE WITH ME?

A microscope, certainly, probably the old fashioned optical type—light in weight, quick results, direct colour vision, no circuit faults or maintenance problems are all points in its favour. I am hoping that units of living matter

Photos.: Plant Protection

will be comparable in size with those we know. If they are very much smaller, I may wish I had a more modern electronic gadget. If they are much bigger, I shall feel very foolish on a stretch of primeval mud, facing an amœba as big as a football field with only a microcsope in my hand, and the brute extending a pair of pseudopodia to engulf me, my retreat cut off by a hungry paramecium the size of the Queen Mary. But, of course, such creatures are *most* unlikely.



Let us be optimistic enough to suppose that I shall find some living creatures more or less the same size as those on Earth. I shall want to bring 'em back alive for preference. I shall need containers of some sort, and I suspect that ordinary cages and collecting boxes will not do. I will have to be able to maintain on the return trip the environmental conditions of my discoveries. Let us consider just what it is that, as a biologist, I am concerned with on a planet. Biology is the study of the living—or of what was once alive. I may very well find myself on a planet which once supported life and can no longer do so, and have to be content with a few fossils, footprints, droppings or pieces of amber. A chunk of Venusian coal might be made to tell quite a story. We will hope for the living.

It is obvious that if any of the strange objects we shall certainly encounter where we are going is to be recognised officially as a living creature by accepted standards, it must be observed to do all, or almost all, of the things that living creatures do on Earth—one or two won't do. It is improbable that our stay will be long enough for prolonged observation. That is where my microscope comes in—even more important than a camera. Be a thing great or small, it is made up of microscopic units called cells—if it is alive at all. And though cell structure on Earth takes a variety of forms, and on some other planet may take a variety of other forms, there will be groups of identical cells in a more or less regular array and, therefore, identifiable.

Having found an object and decided that it is alive, I shall have to be able to get it into some sort of vivarium—a place to live in, which will give it the right conditions to keep it alive until we get back.

HOW DO THINGS STAY ALIVE?

All forms of life which we know on Earth have certain requirements in the way of physical conditions under which they can make use of available forms of energy and material for their own purposes. They need primarily

water in which salts can dissolve, and in which ionisation can take place to make possible the interplay of electrons and atomic nuclei under the stimuli of light waves and warmth to effect the chemistry of life.

Water can exist on Earth only over a range of one hundred Centigrade degrees of temperature, and most life is only possible in the lower half of that range. Does that mean that life is impossible where the temperatures are much higher or much lower than they are here?

Life in hot water is not unknown on Earth. Many bacteria can survive at near boiling point for considerable periods. Some actually thrive in decidedly hot water. To extend the temperature range downwards, there is also a pink Alpine fungus that will sweep across a mountain snow field to give it a charmingly roseate surface.

Among the great range of temperatures to be found on the various surfaces of planets in the solar system, the little interval of one hundred degrees from ice to steam seems unlikely to occur in many places, and so life as we know it is improbable. However, I have already handed my specifications to a firm of domestic heat appliance manufacturers for a series of thermostatically controlled vessels for a range from one hundred degrees below freezing point to one hundred degrees above boiling point. Why? Well, water boils on Earth at one hundred degrees Centigrade because at that temperature the vapour pressure of water is equal to the atmospheric pressure on Earth. There are planets with probably much higher atmospheric pressures, where water would have to reach a much higher temperature before its vapour pressure was sufficiently high to bring about boiling. Here life could very well exist at temperatures well above one hundred degrees Centigrade.

Another factor, and this is a little more revolutionary as a biological conception, is that water is not the only liquid in which salts can ionise. Liquid ammonia is another. Now it is conceivable that some heavy and cold planets have oceans of liquid ammonia. Earth has not a large enough force of gravity to hold hydrogen in its atmosphere. Any that may have been with it at its incandescent birth either formed water with oxygen, or escaped, leaving an excess of oxygen in Earth's atmosphere. A heavier planet would have kept all its hydrogen. Earth's atmosphere contains four times as much nitrogen as oxygen. Is an atmosphere on a heavy planet of nitrogen and hydrogen at one time in its history improbable? As far back as the early twentieth century, the industrial manufacture of ammonia was in full swing on Earth by the direct combination of

hydrogen and nitrogen at the appropriate high temperature and pressure. Such conditions would certainly have existed at one stage in the cooling of a large planet—as they seem to exist now on Jupiter.

Do those oceans of liquid ammonia seem quite so fantastic? There would be rivers and lakes and ammoniacal rain clouds. And in these strange pools and beneath the tides of several moons would there not assuredly be dissolved salts? If so, there would also be ionisation, and why not life itself? Anyway, I'm taking those low temperature tanks with me, and I have ordered lamps to irradiate them with solar equivalent light, and filters to match the effect of various depths of various atmospheres.

Let me also explain that a team of my colleagues has already been consulted by the organisers of the expedition to devise ways and means of maintaining life in the persons of those of us who are making the trip in surroundings that cover a range of temperatures much greater than those covered by my thermostats.

Ionisation also occurs in hot gases, and in cooler gases under the influence of passage of electrons. Life may even be possible in the great oceans of flame of the sun itself. I think the time to investigate is not yet, unless the evolutionary stage reached has produced creatures of such an order of intelligence as to be able to transmit some radiation which, to us, will be intelligible as signals. They will need to know more about us than we do about them! Maybe the physicists could start to tune in. The biologist hasn't a clue.

Another chemical aspect of the living creatures that we know is that they are made up largely of many forms of protoplasm which contain large molecules built on a framework of a lot of carbon atoms joined together. Carbon atoms have the ability to share electrons with each other and so bind themselves together. Odd atoms of hydrogen, oxygen and nitrogen can join the ensemble at various points to make the immense variety of so-called organic compounds, some of which the chemist has learned to built up atom by atom in the laboratory to match the efforts of Nature. A fairly simple example is Cadaverine, found in the putrefying flesh of corpses. The presence of such a compound in the remains of such of my specimens as I fail to keep alive may be the only evidence that I have found living creatures. A rather more complicated example is delphinidin—the colouring matter in delphiniums. I shall certainly try to bring back extracts containing colour giving compounds in some of the strange-hued plants I hope to find.

But again their carbon compounds are only stable over a limited range of temperature and here, again, we seem faced with a limitation on the places in which we can find living forms. However, once more a new chemistry is a possibility. The element silicon is chemically carbon's own brother. Silicon dioxide is very like carbon dioxide, except that it is solid sand or flint on Earth. Carbon dioxide is the king pin in the synthesis by plants on Earth of all the carbon compounds that build living cells. At a temperature way above that of our watery oceans there may be living things in molten sand. The biblical "seas of glass" may take a new meaning. In the very hottest spots on some very hot planet I may find creatures composed of silicone-like substances. I've got the scientific heirs of those early Harwell pioneers perfecting for me a fission heated chamber with controls that will enable me to bring back some of that fused rock as liquid all the way! And I am going to drag those seas of glass with a landing net made of platinum wire.

I'm crazy?

So was Christopher Columbus

A MASTERPIECE IN MINIATURE BY TWO WELL-KNOWN AMERICAN AUTHORS

KATHERINE MACLEAN and MICHAEL PORJES

THE PRIZE

THE SHIP FROM MARS CAME DOWN in a natural clearing. For a time after it landed there was silence as the wind of its onrush settled and the grass which had been flattened by that blow of air straightened again.

Slowly a section of the ship swung open and down, and touched the ground. From its topside slid a long smooth ramp leading from an open gaping door, where the ramp had fitted. In the doorway a blue car, with silvered windows, appeared, or what looked, on first glance, to be an expensive but ordinary car, such as was to be found on the roads in any part of the world. On second glance it would have puzzled a normal observer, for the body of the car was an odd conglomeration of sections. some of which looked like a jeep station wagon, some that looked like a commercial truck, and others that looked like an expensive convertible. The windows were silvered for one way vision, so that the interior was not visible from the outside, and the wheels were the wrong diameter—oddly too small.

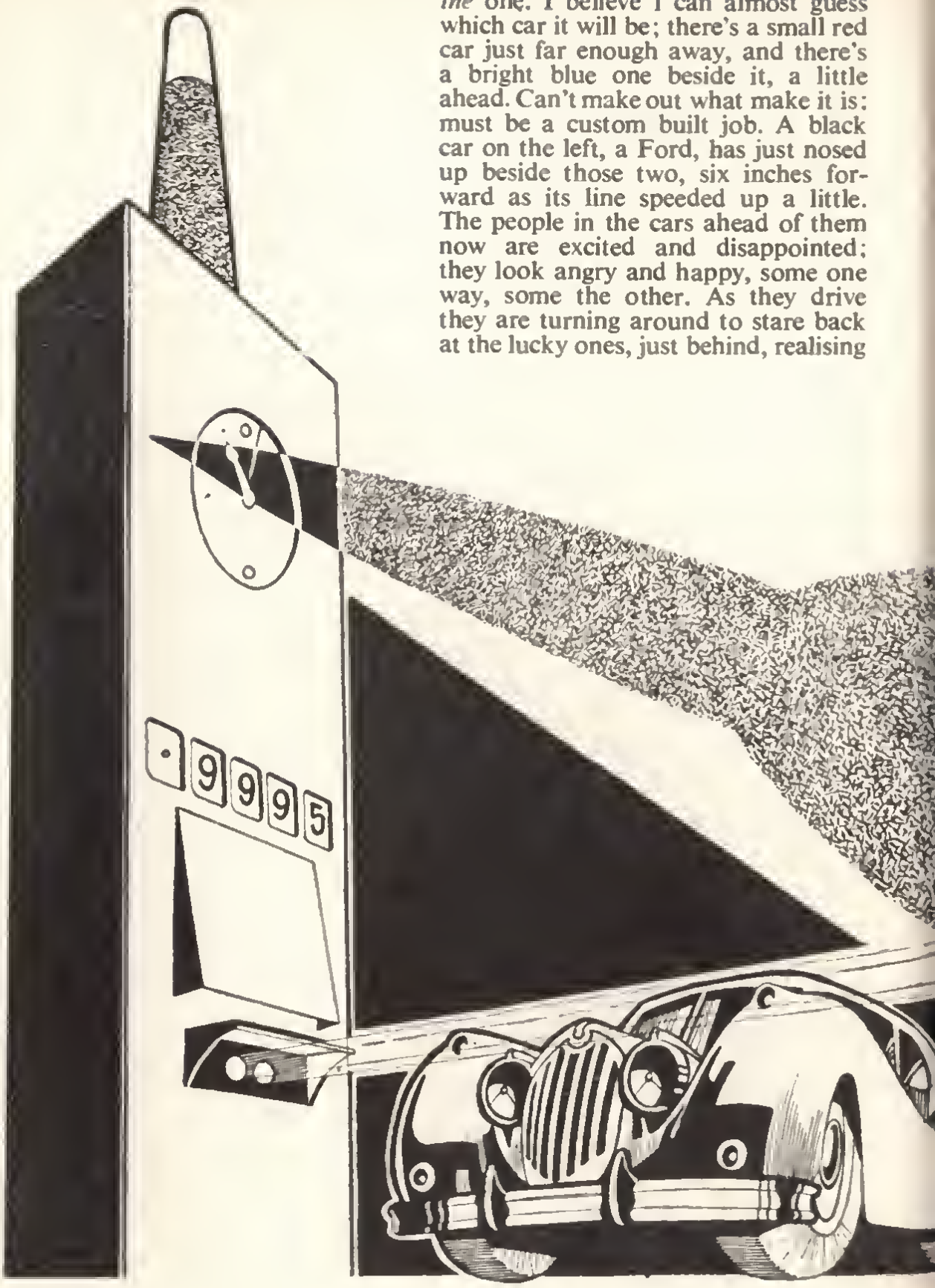
However, only the birds were there to observe, and they were indifferent to the shape of automobiles. The car rolled down the ramp and across the grass and disappeared into the forest in the direction of the nearest highway. The ramp closed.

"*This is Max Stein, your on-the-spot reporter for that great cigarette, Throteze.* This is a great day, folks, and there is a huge crowd out on the highways, trying to win that great prize and be the ten thousandth car to pass the line on the Continental highway on the second day of its opening. They all want that free eight months without working, to circle the globe and visit the deserts where man and science work together to launch the ships that will explore the depths of space. The lure of far places has drawn them here, and mankind's unconquerable urge to find what lies beyond the known. The scientists of the rocket installations will welcome them and let them participate in the great launching. What more could anyone ask than to be known in history as the one personally to see the great leap of science through the void in search of the strange and new? Man, the potential ruler of the universe, takes his next step from infancy!"

As he spoke, the camera eye circled the panorama of cars, jammed together in a long, eager line, crawling over the painted stripe in the concrete, while an elctronic device slowly counted toward ten thousand.

"Only twenty more to go," Max Stein explained in a hushed, tense voice. "Barely a minute. The cars are travelling very slowly, every one crowding the one ahead, trying to be

the one. I believe I can almost guess which car it will be; there's a small red car just far enough away, and there's a bright blue one beside it, a little ahead. Can't make out what make it is: must be a custom built job. A black car on the left, a Ford, has just nosed up beside those two, six inches forward as its line speeded up a little. The people in the cars ahead of them now are excited and disappointed; they look angry and happy, some one way, some the other. As they drive they are turning around to stare back at the lucky ones, just behind, realising



how closely they missed the grand prize. All the cars passing the line now are pulling over to the side, parking on the grass to be close to see the occupants of the winning car."

The sunlight was bright and made easy lighting for the TV colour cameras, which focused on the faces of people in the cars that were passing the line just a little too soon. A woman in one was weeping in frustrated disappointment. Her children in the back seat were waving and pounding the glass at the people in the car

behind, trying to get their attention, wildly excited.

"*The din is terrific,*" murmured Max Stein's amplified voice over the PC. "*Every car for miles has begun to blow its horn in anticipation of the announcement. I was right. It is going to be one of the three cars I saw back in the line. They are approaching the counting point. Nine thousand nine hundred and ninety-seven, nine thousand nine hundred and ninety-eight. I think it is going to be that odd looking custom built model. Nine thousand and . . .*"

The bright blue car with the silvered windows and the odd wheels, immovably jammed in the line of cars, before and behind and to each side, fender to fender without an inch of room to turn, moved helplessly forward as the line moved. And the automatic counter counted, and the figures changed on the dial in front of the eyes of Max Stein and the television audience.

"*. . . ninety-nine. Yes, it is going to be the blue car after all.*" There was a pause, during which only the wailing and howling and hooting of a thousand horns could be heard, and the camera eye scanned again up the highway, over the shining tops of automobiles that stretched six lanes and out of sight in both directions. "*Ten thousand. The blue car is the ten thousandth to cross the line onto the new continental highway! Congratulations!*"

The door of the blue car was gripped and flung open and the inhabitants looked out into the dazzling daylight with their blue tentacles curling in alien approximation to the reactions of surprise and anger. The human outside, with the microphone in his left hand, reached forward with his right in a hearty gesture, squinting to see into the dark interior.

"*Congratulations,*" repeated Max Stein to the observation party from Mars. "*You have* won . . . a free . . . trip . . . to . . . Mars . . ."

FACTS ABOUT THE MOON

Distance . 238,857 miles

Diameter . . 2,160 miles

Volume . 1/49 of Earth's

Mass . 1/81.5 of Earth's

Density . 0.6 of Earth's

Surface gravity
1/6 of Earth's

Escape velocity
1.5 miles per second

Albedo (brightness) 0.7%

Number of craters
over 30,000 counted

Inclination . . . 6.5°

Amount of surface
seen from Earth . . 59%

Time of orbit round Earth
29d. 12h. 44m. 2.78s.

Speed of orbit round Earth
2,000 miles per hour

Mean shadow length
232,100 miles

COLD POWER

by W. W. BYFORD, B.Sc.

HEAT IS ONE OF OUR MOST useful forms of energy—particularly of energy required for transportation. The internal combustion engine uses the expansion of hot gases in the cylinders. The steam engine, whether turbine or piston, uses the heat produced by burning coal or oil to raise steam pressure. Jet engines use the high temperatures produced by burning fuels to move gases at high velocity backwards and so propel aircraft and land vehicles in a forward direction. The rocket, the jumping cracker, the Catherine wheel and the Roman candle contain chemicals which react with each other to produce heat and fast moving gases. Shot and shell, bullets and torpedoes are fired by propellant powders, chemicals such as cordite, which contain molecules which readily break down to form volumes of hot gases, which in their insistence on getting free to expand get things moving.

Those highly efficient combustion engines, the muscles of animals, convert the heat produced by oxidation of glucose to energy of movement.

THIEF OF POWER

In the internal combustion engine heat has to be taken away from moving parts by oil and the engine itself cooled by water, which in turn is cooled by the radiator —even more heat escapes with the hot gases from the cylinder and is discharged through the exhaust pipe. The locomotive engine sends much heat out of the funnel. A Chataway or a Bannister produces much useless body heat which has to be lost as latent heat of vaporisation by perspiration. All of this lost heat represents lost energy. Heat may be a thief of power.

Some of this I have said in

earlier articles, but the fact is I am much occupied in my mind by the problems posed for the spaceman by the association of heat and power. Can we find a way of using heat completely for conversion into power? Apart from the obvious economies of fuel cost and weight, we could do away with the need to ensure adequate cooling devices—again a great saving in the total weight of the ship. Better still, we can produce:

POWER WITHOUT HEAT

There is one form of energy in everyday use that I have not mentioned—electricity. In terms of first principles, how does electricity differ from heat? We know that heat is the energy of movement of atoms. In any piece of iron all the atoms are in motion. In a hotter piece of iron they are moving more violently. An electric current is a flow of electrons, much lighter things than atoms, but moving much more rapidly.

Could we use electricity more economically than we do heat? The answer is probably "yes, once we have got electricity." An immersion heater in a hot tank gives all its heat to the water. A gas-heated geyser or a coke-fired boiler sends a lot of heat up the chimney. The electricity lost as heat in the coils of an electric motor is much less than the loss of energy as heat in fuel consuming engines. Unfortunately, at present we can only produce electricity by using heat, and much of it is lost in the conversion. I leave out of account, of course, hydro electric power. After all, you cannot take Niagara on a spaceship.

The loss of heat in producing electricity for a spaceship would not matter very much if we could do all our wasting on earth and store the electrical energy, already bottled, on board. Unfortunately, at present we can store only small quantities of electricity, and then only in weighty containers. Canoes, trucks and even locomotives, driven by batteries, are in use, but their rate of consumption and duration of service between charges, compared with a journey in space, are negligible.

Electricity can be generated chemically. The Daniell cell, the Leclanché cell and the torch battery do it. But again we have no practical chemical system for producing large quantities of power rapidly and for a long time.

However, let us suppose that we have, somehow, found a way of getting on board either a large store of electricity or an economical method of generating electricity. How are we going to use it to propel the vessel? We have no existing method other than using the electricity to produce heat and then using the heat to produce rocket propulsion; we are back again with all the hindrances and extravagancy of heat.

Now then, let us consider those electrons versus moving atoms. The trouble with moving atoms is that they want to move all other atoms that come anywhere near. That is why heat appears where it is not wanted. Electrons, on the other hand, can be kept nicely in their place by being sent along conductors surrounded by insulators. A little of their energy may be lost in making a few atoms of the conductor move, and so be lost as heat, but with proper balance between voltage and conductor dimensions the loss is negligible. That is to say, electricity is cold power. We can use it to produce movement of air in vacuum cleaners, we can turn the paddles of our washing machines, we can produce volumes of sound in our radio sets; large masses can be shifted by electromagnets without much energy appearing as heat. Can we foresee some better way of using electricity as a space propellent than by way of converting it to heat?

LET'S TRY ANOTHER TACK

In an earlier article I pointed out that in order to send something in one direction we must send something else in the opposite direction. The something else must have weight—mass is a better word of course—and the greater its weight, the greater the forward motive power. The atoms that we send backwards from a rocket are very small

in size and in weight, but we make up for this by sending them at the rate of trillions of trillions per split second even to propel an ordinary planet to planet rocket.

Also, of course, besides the atom-weight factor, we have the velocity of discharge as a factor in building up the forward driving power exerted on the spaceship. This second consideration becomes much more effective than the weight. If we discharge ten tons backwards instead of one, we multiply the driving force by ten, too. If we multiply the speed of discharge by ten, we multiply the driving power by a hundred. Now if we make the discharged atoms move more quickly we automatically make them hotter, and hot atoms have the unfortunate habit of making any neighbouring atoms hotter; and, after all, the discharging tubes will have to be made of something solid. The temperature of the discharge can, therefore, not exceed the melting point or vaporising temperature of the tubes. Also the higher our temperatures the greater the loss of heat in all manner of undesirable directions.

Must we discharge atoms? Why not electrons? The disadvantage of electrons is their infininitesimal weight. Even hydrogen, the lightest of atoms, is a heavy giant compared with an electron. On the other hand, for all manner of purposes, we are already discharging electrons into the air at velocities thousands of times greater than we can ever hope to make atoms move.

Electrons move at velocities which are fixed according to their source. The voltage of a current travelling along a wire conductor is related to the speed of the electrons; the current is a measure of the number of electrons travelling. The electrons which we may be able to use as our spaceship propellent will not be hopping from atom to atom along a conductor but will be freely moving into space, in inconceivably large numbers at enormous velocities. They will not come from batteries; in fact in a sense we shall not even take them with us. It would be true, rather,

to say that we shall make them as we need them. Nor will the particles streaming out behind us consist entirely of electrons. There are equally small particles, such as positrons and neutrinos, and maybe our propellent tail will include many such and others yet undiscovered.

We shall take, not a load of chemicals to make chemical energy, but a very much smaller load of fissionable material. That is to say, we shall take elements made of atoms which can be broken down.

I am not for one moment suggesting that we know now exactly how to split which large atoms into which smaller ones, nor how to avail ourselves of the energy thereby released to break them down still further. Immediately we should be brought up against even bigger problems of heat loss.

Atoms as we know them consist of a nucleus composed more or less equally of protons and neutrons surrounded by electrons. Even if we could separate all our outside electrons from each atom and use them for discharge at high velocities we should have made no advance in solving our problem. We should have to carry a load of thousands of tons of protons and neutrons for each ton of electrons.

I am suggesting the possibility of splitting the split atom. An idle dream? So was the splitting of the atom in my boyhood. Protons and neutrons are small things indeed, but we know of several that are much smaller, and one day maybe we'll think of light itself as the next thing to get down to splitting.

For the present, practical planning of space travel must be in terms of three stage rockets using the powers we know we can produce and handle, but who knows what progress we shall make by the continuance of "old men dreaming dreams and young men seeing visions."

Somebody didn't mind murdering in order to survive, who?

NONENTITY

by E. C. TUBB

THE LIFESHELL WAS A TIN can with stores and a radio, an air conditioner and some accumulators, seven hundred cubic feet of space, a single direct vision port—and nothing else. It couldn't change course, land, orbit or spin. It couldn't do anything but drift, send out a radio signal and hope that some ship would receive it and come to the rescue. It had been designed to hold five people at maximum and now it held seven. It was the slow route to hell with a preview thrown in for free.

The officer was a young man with a uniform ripped and soiled as though he had wallowed in muck and crawled through a hedge. One shoulder sagged lower than the other, his left arm was twisted and tucked inside his belt, and his face was taut with the pain from his broken bones. He sat on the stool before the radio equipment, his legs gripping the stem in a futile effort to remain in position, and stared at the six lives which, technically speaking, were in his charge.

"Would any of you be a doctor?"

They looked at each other, the three men, the two women and the boy, and their silence gave their answer.

"Know anything about first aid then?" The officer bit his lips against his agony. "There's a medical kit . . . drugs . . . if you could dope me up?"

Again the looks, the blank expressions, the dragging silence as each waited for the other to move. Then the elder of the two women moved quietly towards the injured man.

Henley watched her, staring at her worn features, the lank hair, the body ruined by neglect and overwork. He knew her, a widow returning to Earth after wasting her life with a man who had been fated to fail before he started, then let his eyes flicker to the

one stranger in the compartment.

The boy could have been no more than twelve, a pale, huge-eyed youth with the thin features and wasted appearance of those born in space. He huddled in a corner, one thin hand gripping a stanchion to hold him in position, and, staring at him, Henley wondered just who and what he was. An orphan probably, almost certainly now if not before, a waif, uprooted by war and flung among strangers. Idly he wondered how the boy came to be in the shell—the rest had all belonged to the same section—then forgot the boy as Lorna drifted towards him.

"Think he'll live?" It didn't take the jerk of the head to know whom she meant.

"Why not? We're in free fall and a man can live a long time with serious injuries. Worried?"

"You kidding?" She licked her lips with a quick, almost feral gesture, and stared directly into his eyes. "We're in trouble, buster, and don't you make any mistake about it. If pretty boy dies who's going to call for help?"

"Automatic radio call," he said, mildly. "We don't really need him." He kept his face blank at her expression of relief. "Who's the boy?"

"That kid?" She shrugged. "How should I know? Some poor devil separated from his people in the rush." She shuddered at the memory of the past few hours. "God! Who'd have thought people could act like that?"

"Panic," he explained. "Someone loses their head, fear gets out of control, it spreads and before you know it you've a mob on your hands." He looked up as a big man glided towards them. "Jeff! How's your face?"

"I'll live." The big man touched his slashed cheek. "That wildcat nearly ripped out an eye. Damn crazy dame, why didn't she go to her own shell?"

"She didn't get in this one, anyway," said Henley, drily. "You pack quite a right, Jeff. My guess is that you broke her jaw."

"So what? When the chips are down only the strong can survive." The big man dismissed the incident with a scowl. "What's the matter with the old guy?"

"Prentice?" Henley stared up to where the third civilian drifted close to the small, round, star-shot port.

He was old and he was

almost dead with fear. His hands trembled and his eyes had the glazed look of a man suffering from extreme shock. Little globules of spittle drifted from his quivering lips, his skin looked grey, and the sound of his breathing echoed horribly in the confines of the tiny compartment. Shock, terror, the sickening fear of imminent death and the physical frenzy of desperation as he had fought his way into the lifeshell had combined to bring him near madness and death. Time might cure him—if he were given time.

"What I want to know," said Jeff, irritably, "is what happened? All I remember is the alarm going off, the lights going out, and a lot of people screaming and yelling all around. I thought those ships were supposed to be foolproof."

"The pile went, I think. I saw something explode as we blasted free." Lorna looked towards the officer. "Would he know?"

"He should." Henley pushed against the wall. "I'll go and ask him."

The officer looked no better than he had before the first aid. Beads of sweat glistened on his face and neck, and his lips were grey instead of red. He looked up as Henley cushioned himself to a stop against the wall, then stared down at his equipment.

"Can I help?"

"Finished. Mrs. Caulder is quite a nurse." The officer tried to smile at the woman. "Thank you, madam."

"I didn't do much," she said, nervously. "I'm not very clever at that sort of thing."

"You did your best," he said, quietly, then stared at Henley. "I suppose you're wondering what all this is about?"

"Naturally, and so are the others. What went wrong?"

"Nothing went wrong, not in the sense you mean. We were sabotaged by the Numen." The way he said it made the name sound like a curse."

"The Numen!"

"That's right. They must have sneaked one of their people aboard, God knows how or when, and he did a good job. First he spilled the pile then smashed the rod-controls. He wrecked the lighting circuits and gimmicked the air doors. The guts of the pile burned their way towards the fuel tanks and touched them off. We blasted free only just in time."

The officer winced as pain stabbed from his smashed bones. "Damn fools! If they had only kept their heads we could have abandoned ship in good order. As it was, I had to fight my way to the shell and collected a few broken bones on the way." He swore then, bitterly, savagely, more at the human animals who had reverted to the beast than at the saboteur.

"What happened to the Numan?"

"Dead, I suppose. Those fanatics consider a life well spent if they can take some of us with them, and this particular specimen really went to town. A ship and two hundred people, not to count the stores and equipment for the Mars base. We're lucky to be alive."

"Are we?" Henley glanced at the terror-stricken figure of the old man. "What are our chances?"

"No better and no worse than any other lifeshell ever blown adrift. If a ship picks up our call in time we'll be rescued."

"And if it doesn't?" The girl thrust herself forward and Henley realised that everyone in the compartment had heard what the officer had said. "How long must we wait to be picked up? That's what I want to know. How long?"

"Yeah." Jeff joined the girl, one arm slipping possessively around her waist. "When are we going to get out of this mess?"

"A few days, perhaps. Maybe a week or two. It depends."

"And what if a ship doesn't arrive in time? What then?"

"Please!" The officer frowned at the girl and glanced towards the boy. "There's no need to make things seem worse than what they are. Remember the child."

"That's right." Henley smiled towards the boy. "What's your name, son?"

"Tommy, sir."

"Well, Tommy, we're in a little trouble, but you mustn't worry about it. We're all going to be all right. Now you just do as you're told and you'll be home before you know it."

"Yes, sir." The boy hesitated. "Sir?"

"Yes, son?"

"What about the others? My dad got left behind. Will he be home soon, too?"

"Of course." Henley forced a false conviction into his tones as he patted the stringy black hair. "Don't worry about it, Tommy, everything

is going to be all right." He looked at the toil-worn features of the woman. "Perhaps you could take care of him, madam?"

"I'll look after him," promised Mrs. Caulder. She pulled the boy towards her. "Come on now, Tommy, time for you to get some sleep."

Henley watched her as she mothered the boy, recognising a long thwarted maternal instinct in the way she touched him, smoothing his hair and resting his head on her shoulder. He turned as Jeff swore with quiet, bitter anger.

"The swine! The dirty stinking swine!"

"The Numen?"

"Who else? To do a thing like that. Wreck a ship in deep space and kill off women and children as if they were vermin." He knotted his big hands. "If I could just get hold of the swine who did it . . ."

"He's dead," said Henley, tiredly. He didn't want to get dragged into an argument on the merits of the war, and yet, deep within himself, he had a sneaking sympathy for the Numen. Whatever else they were, they were brave. They carried on a hopeless struggle with nothing to help them but their own courage and a fanatical determination to be left alone at all costs. Sometimes it was hard to remember that they were human, of the same stock as the Terrestrials, settlers who had carved a living from the hostile satellites of Jupiter, a living threatened by the occupation of those worlds by the advancing frontiers of civilisation. Perhaps he would have felt different had he lost a wife or son in the wreck, but he hadn't and he was alive, and that was all that mattercd.

Night came with the switching off of the light—to save power, though no one mentioned that—and in the heavy darkness seven people tried to forget worry and fear in sleep. It wasn't easy. Free fall didn't induce physical weariness, and the novelty and danger of their position tended to keep thcm all awake. Henley hooked one leg beneath the strut retaining the air tanks and stared into the darkness, listening to the various sounds sighing and ebbing through the heavy air.

A slobbering, half-baby, half-animal whimpcr, moist and drooling, sucking and horrible—the old man still living with his terror. A whispered croon—the woman

soothing the child. A gasp and a hiss of indrawn breath —the officer with his broken bones. A murmur and a soft whisper—Jeff and the girl. A soft, mechanical drone—the whirling fan of the conditioner as it stirred the air.

He isolated and registered the sounds, identifying and locating the position of each. The officer was still at his radio, his legs gripping the stem of the stool. The woman and child were in the opposite, upward corner; the old man had drifted into the centre of the cabin and Jeff and the girl rested beside the single door.

Seven people—with scaled rations for only five.

After a while the darkness and the heavy air, the lack of distraction and the murmuring silence brought a half-doze, half-coma, and he hovered in the strange region between sleep and waking, his thoughts flitting from one concept to another, touching lightly on old scenes and recent memories. Casually he thought of the war and of the saboteur who had died on his mission. He thought of the panic and the blue-lit hell of the last few moments when men and women had fought in the dim glow of the emergencies as they felt the spur of panic. He visualised his home and his office, the face of a woman he had once known, a friend and an enemy, the possibility of being picked up and whether or not the Numen would ever cease their fanatical struggle.

He snapped fully awake as he sensed someone at his side.

"Henley?"

It was the girl, breathing directly into his ear, the soft mass of her hair brushing his cheek as she hovered beside him. He waited a moment before answering, locating the heavy breathing of the big man where he drifted, finally asleep, almost seven feet above.

"Yes?"

"It's me, Lorna." She gripped his arm and drew herself even closer. "Look, you're intelligent, at least you can't be as dumb as that big ox. Maybe you could answer a question."

"Maybe." He kept his voice low, too, whispering directly into her ear.

"How much air and stuff does this shell carry?"

"Enough," he said, carefully. "Why?"

"Don't give me that," she said, bitterly. "I may be a cheap dancer working the

dives, but I'm not stupid. Look, there're seven of us in here and there isn't room to spit. How long can the air and water and stuff last?"

"We carry scaled rations to last five people for a period of twenty-five days." He wished that it were light so that he could see her expression. "That answer you?"

"And how long will it take for us to be picked up?"

"I don't know. You heard what the officer said."

"I want the truth, Henley. I'm a big girl now."

"When the ship blew, a signal was broadcast on the emergency band. It will be received and the nearest vessel will head towards us. They will know the flight pattern of the ship, its velocity, the time of the explosion, and from that can work out just where we are. All they have to do is search until they pick up our signal."

"How long?"

"They've probably received the signal already, but the nearest ship could be going away from us and so would pass it on. We'll have to wait until a ship can match velocities and, of course, they will have to get here from wherever they are." He hesitated. "I don't know how long it will take."

"Days?"

"Highly unlikely."

"Weeks?"

"Perhaps. Perhaps a month. It's impossible to say."

"I see." Against his ear he could hear the hiss of her indrawn breath. "Rations for five and we're carrying seven. Six—the boy doesn't count. Say a month. Say . . ."

"If you're trying to work out what I think you are, I can give you the answer. Eighteen days."

"I make it different."

"Jeff uses a lot of oxygen and he's going to need a lot of water. He and the boy make two normal adults between them. Eighteen days."

"And you said that we couldn't be picked up for at least a month." Abruptly her fingers were digging into his arm. "Henley! What can we do?"

"We?"

"Sure! Why not? The old guy's almost dead and the officer's well on the way. Jeff is dumb. Who have I left?"

"I don't like what you're saying," he said, curtly. "We're all in this together and I'm not going to be a

party to killing anyone for their rations. I——"

"Killing? Who said anything about killing?" Despite the denial she didn't raise her voice. "I never suggested——"

"Work it out for yourself," he said, impatiently. "The only way to stretch the rations is for someone to stop using them. I want no part of it."

"You . . ." For a moment he thought that she would strike him. Then she swore, thrust angrily at the metal and drifted away.

He shrugged.

The lights came on and they ate, cold, tasteless paste from cans washed down with stale water sucked through a nipple. Lorna ate in sulky silence, not looking at Henley, and after the meal drifted into a corner with Jeff, their heads bent close together. The woman moved towards the officer and Henley joined her as she opened the medical kit.

"How is he?"

"Bad. The collar bone is smashed and I think some ribs as well. His arm is useless and there's some internal bleeding." She fumbled among the small store of drugs. "There's nothing I can do."

"Will he die?"

"I don't know. I hope not; he's such a nice young man and it's a pity that he should end like this." There was a naked sincerity in her voice and Henley was surprised to find her eyes brimming with unshed tears. "He reminds me of Joe, my husband, when we first met. That was back home before we left for the asteroids. I . . ." She gulped and shook her head. "You wouldn't be interested in that."

"I could be interested," he said, gently, and took the hypodermic from her hands. "Let me do that."

"Can you?"

"I can give an injection—if you tell me what to inject." He glanced towards the boy, hunched against a wall, wide-eyed and shrunken. "Go back to Tommy now, he looks scared." For a moment mother instinct struggled with duty; then, as Henley turned towards the officer, her maternal feelings won and she returned to the thin-faced boy.

"How are you feeling?" Henley carefully slipped the needle into a vein and pressed the plunger. "Better?"

"I suppose so." The officer tried not to show his obvious pain. "That stuff could be water for all the good it

seems to be doing. How are the others?"

"Same as usual." Henley wiped the hypodermic and replaced it in the medical kit. "Prentice doesn't seem to be any better."

"The old man?" The officer couldn't shrug, but his meaning was plain. "He's had his turn. I'm more concerned with the boy. A hell of a fine way to start life. Those damn swine! I wish they were here now to see what they've done." He gulped, his face a mask of sweat, and gestured for Henley to stoop closer. "Look, I think that we'd better come to an understanding."

"How do you mean?"

"I can't last much longer, and the way I feel now the quicker I go the better I'd like it. Maybe it's just as well; we don't carry anywhere near enough stores for us all to last, and my share may mean life for someone." He stared at Henley. "I want that someone to be the boy. The rest of us are full grown and we've had our time, but the kid never had a chance. Understand?"

"Is it as bad as that?"

"Yes."

"How long do you think?"

"Weeks, maybe. A month at least." The officer swayed a little, and perspiration streamed from his contorted features. "Don't kid yourself, Henley, this isn't going to be easy. Lifeshells are nice in theory. They can even be useful on the Tri-Planet runs, where space is full of ships and a one-week wait is the most expected. But we're a long way from the sun and space is a hell of a big place. Out here lifeshells are a morale factor; they're comforting to have around—so long as you don't have to use them. The rations are supposed to last twenty-five days, but that's all in theory, and as soon as you overload you're in trouble. That's another good reason why I'd better clock out pretty soon. While we're two extra the consumption goes up double."

"Double!" Henley remembered to lower his voice. "I don't get that. I made it that we could last eighteen days."

"Excess humidity for one thing. Heat for another. We're not losing any heat, you know, just a little by radiation, and there are seven of us acting as quite efficient heat sources. The conditioner can't stand too much overload . . . carbon dioxide . . . non-conduction . . ." The officer shook his head as he swayed again.

"The hell with it. I can't give you a lecture. Just remember what I said."

Henley left him then, left him alone with his agony and the invisible burden of his responsibility, swaying and sweating from the pain of his torn tissues and crushed bones. And yet, despite his pain, the man could still think of the one thing which had made his race what it was. He could still think of the next generation.

Three days later he was dead, and those remaining faced a new problem.

There was no air lock in the lifeshell. The single door opened, if it were possible to open it at all, directly on space, and the refuse ejectors were far too small to permit of the expulsion of anything so large as a body.

"You'll have to get rid of him." Lorna made a point of not looking at the silent figure, still sitting on the stool, the legs bound with a torn fragment of uniform. "If I have to stay in here with that I'll go crazy!"

"Yeah." Jeff automatically clenched his big hands as if the problem could be solved by physical violence. "How do we do it, Henley?"

"We can't."

"You've got to. I can't stand him sitting there like that! I can't stand it, I tell you!"

"Shut up, Lorna!" Henley stared at the big man. "She's right, though. We can't leave him like that. In a couple of days he'll start going bad and you know what that'll mean." He glanced at the others, the woman hunched against the boy, the old man still whimpering to himself as he wandered in the regions of his mental terror. "As far as I can see it there are only two ways. We can seal him up in one of those big plastic bags in the locker, or we can pass him through the refuse ejectors. I suggest that we seal him up. I've an idea that is what those bags are for, and if we seal it, it should be airtight."

"I don't like it," protested the girl. "Even if you seal him up he'll still be in here. God! You think I want to keep company with a corpse!"

"What else can we do?"

"We could cut him up," said Jeff, slowly. "The ejectors would take small pieces and we could get rid of him that way."

"You know what would happen then?" Henley stared bleakly at the big man. "His blood would drift in tiny

globules and break against whatever they touched. The human body holds quite a bit of blood, Jeff, and I don't think you'd like living under those conditions. A slaughterhouse would be hospital-clean in comparison."

"But we'd get rid of the body."

"Yes, and then we'd have to get rid of the blood." Henley shook his head. "We'll seal him up."

"Who says so? I don't remember anyone making you the boss. Who are you to give the orders?"

"Do you want to give them?" Henley shrugged. "Go ahead, then. Jam the ejectors and let our air escape into space. Fill the shell with blood and tissue then. When it goes bad, maybe you'll figure out a way to clean the air. Me? I don't give a damn. If you want to act big in front of your girl friend go ahead, but when you're spewing your life out two hours away from rescue, maybe you'll regret it."

For a moment it hung in the balance. For a moment Henley thought the big man would react in the only way that seemed possible to a man of his type, with fists and boots, and blind, savage violence; then, to his relief, the big man blinked and nodded. "We'll seal him up."

The job didn't take long and Henley was glad of it. They pulled one of the two huge plastic bags over the body, sealed the edges and fastened the shapeless bundle to a stanchion. Then they tried to forget it, tried to ignore the fact that it contained what had once been a man, and who, even though dead, still kept them company. Tried—and failed.

For death was too close. It hovered all around them, in the flickering needle of the air gauge, the falling hand of the power supply, the dwindling stores of food and water. Death rode the hands of the chronometer—and they all knew it.

And knowing it, reacted each in their own fashion.

Prentice did nothing. Lost in his mental world he drifted like a thing of wood, uncaring, unaware, whimpering his animal sounds and twitching with his baby motions. The woman said nothing, but she clutched the boy a little more possessively, watched a little more sharply. The boy did nothing—merely watched and did as he was told, his wide, dark eyes and thin face

a constant reproach to selfish thoughts. Jeff became a little more arrogant, a little too eager to grab his share of the rations, a little less polite and far more possessive. Lorna did something about it.

She came up to Henley one "night," drifting like a pale ghost in the dim star-glow from the single port, and settled beside him where he sat on the stool.

"How are we going?" Again she whispered directly in his ear, her hair brushing against his cheek.

"As expected. Why?"

"You know what I mean. How long can we last now that the officer's dead?"

"About eight days."

"Eight! How's that? With one less we should be able to last a lot longer."

"It isn't as simple as that. The overload cut down our time by half and the officer died too late to do us any good. I'd guess eight days, maybe ten, maybe seven. I don't know."

"And the rescue?"

"At least twice as long."

"So we're going to die."

"Naturally. We've been going to do that since the day we were born."

"Don't get clever with me, Henley, you know what I mean." Against his ear her voice was surprisingly harsh and bitter. "We're going to die . . . unless . . ."

"Unless what?"

"The old man's pretty useless," she said, softly. "He doesn't eat much, but he breathes a lot of air. Why should we all suffer to keep one worn-out old man alive?"

"Are you asking me, or telling me?" He stirred impatiently on the stool. "You tried this once before, Lorna, and my answer is still the same. We live or die together."

"Why? Why should we consider others at all? It's our life, isn't it? We've only the one, and I intend hanging onto mine. If you weren't so damn noble you'd feel the same way."

"Shut up!" He didn't trouble to lower his voice. "I know your kind, Lorna. Selfish and rotten to the core. You've always had what you wanted and you've always managed to find some poor fool to get it for you. Now you want life, and you think I'll kill so that you can fill your lungs for a few days longer. Why should I? What the hell are you to me?"

"I'm a woman, aren't I?"

"So what? What's so special

about being a woman? You think I'm like the rest of the morons you've met? Do you think I'd do anything for a woman merely because she is a woman? Get wise to yourself, Lorna. To me you're just a lump of flesh and nothing else. Remember that."

"You——"

"Say that again and I'll smash your teeth down your throat. What's the matter, Lorna, won't Jeff play?"

"Go to hell!"

"We're all going to hell, Lorna, one way or another."

"You're a fool," she said, bitterly. "I'm not just talking of myself; there's others to consider—the kid, you, me. What is the old man to us? Nobility is all right in its place, but not here, not when we're racing the clock and losing out on every breath. If he died we'd all stand a chance."

"We'd stand a better chance if Jeff died; he's big and uses too much air, radiates too much heat."

"Leave Jeff out of this."

"Sure, but if we're talking of survival, let's face the facts. You mentioned the old man, I mention Jeff. If they both were to die, maybe we'd stand a chance. The old man alone won't make any difference."

"You wouldn't dare try to kill him."

"Did I say anything about killing? You brought the matter up, not me, but suppose you got your own way and only the two of you were left. He's a big man, Lorna. I'd say that he uses twice as much air as you do, and he isn't particular how he gets it. Remember the way he hit that woman? If you were the last two alive, could you trust him?"

"I think so," she said, uncertainly. "He likes me a lot, he wouldn't do anything to hurt me."

"No?"

"No."

"Then you've nothing to worry about, have you?" He stretched and smiled into the darkness. "Forget it, Lorna. You're tired and worried. Better get some sleep now; things will seem better in the morning."

She left him as silently as she had come.

With the morning came horror.

It came with "day," with the flashing of the single light, and it came with blood and violent death. Prentice was the one who died, his

throat punctured and his blood spraying in a thick, red mist from the force of his slowing heart. Jeff was the one who hovered beside him, a knife in his hand, a foolish expression on his face, blood on his clothing and dull wonder in his eyes.

"He's dead," he said, stupidly. "The old man's dead."

"So he is." Henley felt his stomach muscles tighten as he stared at the big man. "What made you do it, Jeff?"

"Do it? Do what?" Understanding and rage came together. "I didn't kill him."

"No?"

"Damn it! I tell you I didn't kill him and you can't make me say I did! I was asleep, drifting, and I heard a groan. I reached out and felt the knife and at the same time you put the lights on. Hell! Anyone could have done it!"

"Who?" Henley shook his head. "You might have got away with it, Jeff, but you were unlucky. Another minute and you'd have been in the clear. You could have got rid of the knife, perhaps palmed it off on someone else, and the blood would have stained us all." He took a deep breath. "Sorry, Jeff, but the facts are plain."

"Are they?" The big man closed his fist around the knife and glared his defiance. "We'll see about that. I'm innocent and I know it, and when we get picked up the lie detectors will prove it. Someone in here is a murderer, and the only thing I'm certain about is that it isn't me." He glared at the others. "It could have been you, or Lorna, or the woman. How do I know that one of you didn't do it?"

"I was sitting here all night," said Henley, tiredly. "Lorna?"

"I was with you part of the time, with Jeff some of the rest." She didn't look at the big man. "I was by myself just before the lights went on."

"Mrs. Caulder?"

"Asleep. Tommy was restless and I didn't drop off for some time."

"You see? No one's got an alibi. I just happened to be the unlucky one." Jeff stared down at the dulled blade. "Someone must have carried this thing on him, and it's not likely that it belongs to a woman. That leaves you and me, Henley—and I know that it wasn't me."

"I didn't kill him," said Henley, tiredly. He kicked himself from the stool. "Talk-

ing is getting us nowhere. Let's seal him up and get him out of the way."

They used the second and last of the big bags for the job, and lashed what remained of the old man beside the officer. They worked in silence, avoiding each other's eyes, and the sense of guilt and helplessness drove them apart as soon as the job was done. Henley held out his hand.

"The knife, Jeff. I'll take it."

"I'm keeping it."

"I want the knife, Jeff."

"You can keep on wanting." The big man glowered his hate. "And another thing, the light stays on. I'm taking no chances on getting stabbed in the dark. Someone in here is a killer and I don't intend to be next. I'll keep the knife for self protection, and if you don't like the idea, you can try to take it from me." He grinned, an animal writhing of the lips utterly devoid of humour. "If you've got sense, Henley, you won't try it."

It was an ultimatum. It was defeat and Henley knew it, and the knowledge was bitter in his mouth. Angrily he returned to the stool, then glanced up as Mrs. Caulder drifted towards him.

"Mr. Henley."

"Yes?"

"I'd like to talk to you." She glanced at the others and bent her lips to his ear. "Privately."

"Go ahead." He bent his head, and like two lovers, they sat cheek to cheek, each whispering into the other's ear.

"It's about Tommy," she whispered. "I'm worried about him."

"There's no need to worry, Mrs. Caulder. It's a trying time for all of us, but he's young and he'll get over it."

"I don't mean that," she whispered. "It's something else. I think . . ."

Her voice faded with the dying of the light, and in the sudden darkness Henley felt her stiffen and the sound of a curse.

"What the hell? Put those damn lights on!"

"I'm trying." Henley fumbled for the switch, found it, flipped it without result. "Must be fused."

"Like . . ." Jeff's voice cut off with a peculiar gurgle and something wet and warm sprayed Henley's face with sticky moisture. Desperately he fumbled at the unfamiliar wiring, tracing the strands from the switch to the fuses, feeling his way until current

stabbed at his fingers with sudden pain. Gingerly he felt the wires, touched the severed ends together, and blinked in the sudden light.

"What happened?" Lorna was crouched in a corner, her face distorted with fear and terror, her skin dappled with tiny red patches.

"Someone cut the wires." Carefully Henley twisted them together and frowned down at the join. He touched his face and stared down at his stained fingers. "Jeff!"

The big man didn't answer. He couldn't answer; the knife thrust into his neck gave the reason and explained the red mist filling the compartment. "Lorna! Are you all right?"

"Yes."

"Mrs. Caulder!" Henley kicked himself towards the woman. "Mrs. Caulder! Are you sick?"

She wasn't sick. She would never be sick again, and as she drifted a limp and inert bundle, her glazed eyes stared at the light with pathetic hopelessness, their expression matching the distorted angle of her head.

"Dead!" Henley gently felt at the thin neck. "Broken, and someone killed Jeff." He stared accusingly at the girl.

"It wasn't me, Henley. I swear that it wasn't me." She cringed at the murderous hate in his eyes. "I stayed where I was when the lights went out. Henley! Don't look at me like that!"

"I can understand the old man," he said, thickly. "He was no loss to anyone. I can even understand Jeff, he would have been dangerous, but to kill the woman! To murder a decent, inoffensive woman whose only concern was for the boy. Damn you, Lorna, you've gone too far!"

"I didn't do it," she pleaded. "I didn't do it."

"You cut the wires," he accused. "You saw your chance to safeguard that precious life of yours and you took it. Three dead and three to go. How long can we last now, Lorna? How long can we last now—damn you!"

Hate mastered him then. Hate and rage, and a sick distorted feeling of repulsion and murderous frenzy. She was strong but he was stronger, and even without weight he still had the greater mass. Her throat was slippery with blood by the time he gripped her, his hands were red with it, the entire interior was awash with sticky wetness, but it made no difference and he

smiled as he watched her die.

Afterwards, when he realised what he had done, and more important, whom he had done it before, he felt shame and guilt and a terrible revulsion of feeling.

"I'm sorry, Tommy," he said, quietly. "But she was a bad woman, you know that, and she had to die."

The boy didn't answer. He sat as he had sat since the beginning, wide-eyed and silent, watchful and poised like an overscared young animal, ready to run, but not knowing from where danger would come. Henley sighed as he looked at the boy, so young to have suffered so much, and, turning off the light, settled down to wait for rescue.

Somehow, it was better in the dark. It was better still when he finally drove himself to lash the drifting bodies to a stanchion, and even though the blood was a nuisance, yet it could be borne. He was safe. He was alive and the others were dead. He alone of them all would return to Earth and the warm comfort of civilisation.

And he had a witness to prove his innocence.

He smiled as he thought about it; then, still thinking, he lost his smile. The officer had died a natural death, there was no mistake about that. The old man? Jeff. But Jeff had protested his innocence and held onto the knife. Mrs. Caulder had been touching him when the lights went out. Jeff had been talking to Lorna, so . . . who had cut the wires? And who had killed Jeff, big and armed and ready for trouble? And who had killed the woman, and why? She had died from a cunning blow to the neck, a skilled and highly technical blow unlikely to be known by the average person. Jeff could have done it, but Jeff was dying with a knife in his throat. Who?

"Tommy." Henley tried to keep his voice calm and even. "Where are you, son."

"Worked it out yet, Henley?" The voice was the same, high and weak, and surprisingly boyish, but the tone was that of a man. "Surprised? You shouldn't be. It was pretty obvious from the start."

"You! You did it!"

"Of course." The boy—it was hard to think of him as other than a boy—chuckled. "I'm the saboteur you were all talking about. The scum you wanted to find and hurt. The filth you hate and despise

because we're a little different from you and want to be left alone. You should learn more about your enemies, Henley."

"So you're the Numan. You wrecked the ship and managed to get on this lifeshell." Henley laughed, without humour. "My God! And the officer died so that you could have his rations and a chance for life. You were the one we all felt sorry for. You!"

"The more fools you." There was nothing but acid contempt in the young voice. "I'm a Numan, yes, what you would call a midget, and I wrecked your ship and killed your people. Why not? We are at war, aren't we?"

"Then you must have cut the wires. You killed Mrs. Caulder and the others, but why? We meant you no harm."

"The woman suspected, but even without that she would have had to die. All of them had to die. You don't know much about survival, Henley. Jeff thought he knew, but he only played with the idea. To survive at all you have to be strong all of the time, not just a part of it. That's why we are going to win this war. We never stop, we daren't stop; for us the only rest and peace is in the grave."

He paused, and in the silence Henley fumbled for the switch and tried to throw on the light. He wasn't surprised when nothing happened.

"I wanted the air and food in this lifeshell and to get it they had to die. You had the same idea, the girl, too, but you did nothing but talk. I didn't talk, I acted, and now I shall survive while the rest of you rot." He chuckled again. "Funny, isn't it? When the rescue ship arrives they will all be so sorry for the poor little waif without a home, the nonentity caught in the cross currents of war. They will look after me, take me to Earth, give me a home, and then . . ." He sucked in his breath. "Then I'll show them what their 'scum' can do."

"Perhaps," said Henley, softly, and kicked himself to one side as steel lashed towards him. Savagely he struck out with the medical kit in his hand and grinned as he heard the knife tinkle against the plating. "Now we're even, you little swine. Now we'll see who survives. You made a mistake, Numan; you talked too much, but then you couldn't help it, could you? Half-pints like you always like to brag." Carefully he

drifted across the compartment. "We aren't really soft, you know, not anywhere near as soft as you like to think. We respect our children and ignore nonentities, but, once we know them for what they are, we haven't the slightest compunction at killing our enemies. I'm bigger than you, with more mass and greater strength, and I'm going to kill you—slowly."

He drifted back across the cabin, feeling the sticky wetness on his face increase as he brushed against the hovering blood globules, and hate and rage, sorrow at what he had done to the girl, and anger at having been made a fool, all combined to fill him with a killing frenzy.

He didn't know that the air conditioner had stopped, clogged by the drifting blood, and that it was only a matter of time before he, too, would be dead.

Get Integrated

by Peter Summers

THE title of this article is a very common phrase in America at the moment, and, in a different form, is quite common in Britain. Its message could be said to be the basis of all psychological and psychiatrical advice and intent. Yet, as I hope to convince you, it is a doctrine that, if effected, would halt civilisation in its tracks.

Let me say at once that I am not necessarily suggesting that such a halting would be a bad thing. That is a topic for another argument. But I *am* suggesting that the exponents of the doctrine of "Get Integrated" probably do not realise that they are encouraging a state of stasis in society. This kind of thing has been the basis of very many classical science fiction stories, and I'm sure you will concur that it will do with some discussing.

What, first of all, does the doctrine mean? When one American says to another (or to another several millions if he happens to be on radio or television) "Go get yourself integrated" he means "Adapt yourself to the conditions around you, so that they don't get on your nerves and make you sick or in some measure an agitator." The doctrine comes out quite clearly in another Stateside expression: "He's just a poor mixed-up kid"—implying, truthfully no doubt, that if the child could be "unmixed-up" he would not get himself into the particular scrape under examination. Here in Britain we say the same kind of thing but not so succinctly. Nearly everybody believes that people would be happy and harmless if they were not in some degree at war with their environment. Modern legal

reform is based upon the doctrine of adaptation—put a criminal in harmony with his environment and he will cease to be a criminal. Modern parenthood uses the doctrine of adaptation for all its sub-doctrines—bring the child up in tune with his environment and he won't be a trouble to anybody.

Now, there is no disputing the truth of these ideas—unless one accepts the principle of ingrained wickedness, which does not well stand up to close examination. Undoubtedly people in harmony with their environment do not commit crimes. And undoubtedly nobody has any trouble with a child that is in tune with its environment. It could be argued that such harmonising and tuning would be impossible, since it means allowing people and children to do whatever they want. But, cogent as that argument is, we are not concerned with it here. We, here and now, are quite prepared to assume that it *would* be possible to do these things. We are concerned with what would happen if we did, and to this there is a rather remarkable clue.

If you go and dig about in the mud in certain regions of the world you may find an ugly little beast only an inch or two long and looking rather like a sort of worm, poking its head out of the slime, but seeming to take very little interest in what is going on around it. This will be what zoologists call *Lingula.* It is, if you like long words, an ecardine brachiopod. On the face of it there is nothing to distinguish *Lingula* from the thousands of other different types of animals that thrive in mud. But if you look into the matter you will find that *Lingula* is unique, and this is what makes it so:

The period of time 550 million to 700 million years ago is known as the Cambrian period. It is the very earliest period of which we have a record of living things. And part of that fossil record is *Lingula*—in every feature exactly as it is today.

Do you realise what that means? It means that while all other creatures were evolving, changing their forms and

habitats, right through all the various stages in the biological history of Earth, little *Lingula* stayed as it was. The fishes came and ruled the world. *Lingula* just looked on. The amphibians ousted the fish and slithered in dominance from lake to lake. *Lingula* didn't even blink. The reptiles—mighty monsters who crashed and slashed their way about the world—took over from the amphibians. *Lingula* just blew bubbles in the mud. Time came when the reptiles had to give up as the mammals and the birds reigned supreme. *Lingula* couldn't have cared less. Eventually Man turned up and started reshaping the world to his liking, with houses and bridges, and battle ships and bombs. *Lingula* just went on bubbling.

Surely, *Lingula* is *the* original stick-in-the-mud!

Why? Because, from that period of something like 600,000,000 years ago, *Lingula* has been *in harmony and in tune with its environment!* There has been no need for it to change. No need for the little worm to turn and throw its weight about, killing and dominating the world. Through all those years, *Lingula* has led an idyllic, blameless, harmless existence in the quiet tranquillity of the world's mud—perfectly adapted.

The parallel with humanity is obvious. Human society is yet young—a good deal less than one million years old—but it has undergone a great many changes and is now hardly at all similar to what it was. These changes must have been brought about by people who were imperfectly adapted to their environments. Their names are in all the history books—Genghis Kahn, Napoleon, Cæsar, Hitler, Alexander and, perhaps less, or perhaps more, important, Lister, Pasteur, Newton, Galileo, Einstein. There are many more.

Such people refused to take the world as they found it, refused to fit themselves into a niche of inactive spectatorhood. They were ill-adapted, and because they were ill-adapted they *did* things while those around them who were well-adapted looked on like *Lingula* from the mud of their

contented minds and let the great big world go by.

Now, as I said before, the question of whether the changes in human society—that is, the results of the activities of ill-adapted people—are good or bad is an argument that we are not here engaged in. It may be that many of us hanker for a kind of Shangri-la, while others couldn't bear the place. This, perhaps, merely serves to identify us as adaptable or ill-adaptable (though we must remember that those who yearn for Shangri-la are probably ill-adapted to their present environment yet lack the abilities to change it). What does stand out clear is that if we all followed the advice of the psychologist and psychiatrist, if we all "got integrated" *the advance of civilisation would cease at that point.* If there weren't any "mixed-up" kids around now, the next generation would mark the end of human progress in every single respect, material and spiritual.

Don't for one moment think I am maintaining that the future advance of civilisation is in the hands of juvenile delinquents! Maladaptation may be expressed in so many ways; crime is only one of them; reform is another; so is the scientific attitude. But I am saying that the degree to which a person is in tune with, content with, in harmony with his environment, is a measure of his uselessness to human progress as that is commonly understood.

Some people may object that this is not a legitimate argument. They will say that we are drawing an unjustified analogy between material evolution and mental progress. But I do not think that such objections can be sustained. I am not suggesting that mental development takes place according to the same laws or is the result of the same causes as material evolution. I am merely pointing out that the fundamental requisite for both of them is maladjustment to the environment.

It should be obvious that just as a material organism will not change if a change is not advantageous to it, so

human mental attitudes will not change unless some advantage will accrue or will be believed to accrue.

The fact that probably nobody at the present time *is* perfectly adapted to the environment does not affect the issue either. The main point is that with the current upsurge of interest in psychological matters there has arisen a world-wide desire to attain adaptation or integration with the environment. This desire is not related so much to the question of changing the actual environmental conditions as to changing the mental attitudes of individuals. What I am attempting to show is that such changes are not, collectively, progressive but retrogressive.

No doubts can be raised about the efficacy of integration where the individual is concerned. No life is easier on the mind than the one in which no questions are asked or—which comes to much the same thing—all answers accepted. We all of us know some people who are like this. They are always smiling, always happy, never grumbling, never wanting to overthrow some system and replace it with a new one. That to us they may appear somewhat cowlike in their docility does not alter the fact that they are content. We may be safe, however, in believing that they will never contribute anything to man's progress.

A few individuals do not matter. It is only when we consider the possibility of all or most of us becoming similarly content that we may view with alarm the present psychotherapeutic trend.

It would seem that we cannot sit back and allow this to happen. We must recast our ideas about adaptation in order that the good of the individual shall not be the downfall of the society. We cannot accept the idea of adaptation on its own. Neither can we hopefully cast aside the doctrine of adaptation. What, then, are we to do?

The answer, surely, lies in an examination of just what maladaptation really is and what it can be. If it takes the form of anti-social ac-

tivities, then, of course, it is a bad thing both for the individual (because he will be punished) and for society (because it must bear the expense of punishing him). But if it takes the form of some activity that is unquestionably to the benefit of society and the individual, then there is nothing wrong with it. If a man's maladjustment makes him compose fine music, or search for a cure for some disease, or paint beautiful pictures, or agitate for some progressive social change, then that maladjustment will contribute to the advance of civilisation.

Thus, the answer to our question is really very simple. The search for perfect adaptation is both futile and harmful. Rather should we try to adapt our maladaptations! In other words, we should accept the fact that we are not in tune with our environment and should simply strive to ensure that our consequent activities are geared to constructive things.

All that is in very general terms. Pinning it down to specific points is by no means easy. It is an exercise I leave with you. It is an exercise we should indulge in all our lives. That way we shall be of less trouble to ourselves and of more use to those around us.

It was the most efficient unit yet devised.
But you couldn't get past its—

DEATH-WISH

by ERIC WILDING

THEY CAUGHT HIM WITH the knife at his throat, the bright red blood welling from the razor edge as it sliced through skin and fat, muscle and sinew, cutting down towards the pulsing carotids and throbbing arteries below. They shocked him with stasis and took away the knife. They staunched the blood and sealed the wound. They placed him back on the narrow white cot in the narrow white room and there they left him, still in stasis, blind and dumb, deaf and paralysed, his body helpless and only his mind aware.

Left him to his thoughts—and memories.

War!

A drifting boredom spaced by sickening fear and sudden violence. The long, tedious, nerve-grating conflict of interstellar struggle. The blare of the alarms, the rapid manœuvring, the blinding incandescence of exploding atoms, the sweat, the panic, the frantic urge to run and run, and keep on running, and sometimes, very rarely, the actual capture of an enemy vessel.

The captured Head wasn't much help. It lolled above the humped bulk of its maintenance machine, its eyes glazed, a thin stream of spittle drooling from the corners of its mouth, its lips twisted into an idiotic grin. It could hear, of course, and the pumps supplied air to its throat so that it could even speak. It could see, too, though that wasn't necessary, and once, perhaps a month ago, perhaps a decade, it had even been human.

But not any more.

Longstrom felt ill as he stared at it, his eyes drifting in awful fascination over the naked, hairless scalp, the deep scars, the distorted tissue where metal and plastic wedded with flesh. The thing stared back at him, rolled its eyes, giggled, and licked its lips with a repulsive, almost obscene gesture.

He vomited.

Harding was pleased. Harding was the captain, the leader, the man in charge. He wore his uniform as if it were a second skin and he had long ago stiffened his bones into metal struts, converted his heart into a stone, and replaced his emotions with a blank void in which shone only the lambent flame of duty. He smiled as he stared at the horror, frowned at the weakness of his computor man, and turned to Carter, his gun officer.

"Report."

"No signs of enemy life, sir." Carter tried not to look at the Head. "They must have abandoned ship when we registered our first hit. Engines are damaged beyond repair or recognition."

"A pity. Earth could have done something with undamaged engines." Harding frowned as if the action of the enemy in ruining their vessel was a personal insult. He smiled again as he stared at the Head. "Still, we have this."

"Yes, sir."

"You don't sound happy about it, Carter."

"No, sir." Carter forced himself to stare at the Head. "Are you going to kill it, sir?"

"Kill it?" Harding didn't trouble to disguise his impatience. "Why should I?"

"It would be a mercy, sir. After all, it was a man once, and——"

"You're a sentimental fool, Carter. This Head is important to us and you babble about killing it." Harding stooped and stared into the ravaged features of the thing. "Can you hear me?"

"... yay ... yay ... yay ..."

"Attention! Answer me! Can you understand?"

"... yay ... yay ... yay ..."

"Shock, perhaps, sir?" Carter glanced at Longstrom, busy wiping his mouth and making a point of not looking at the Head. "I understand that it would be connected to the outside detectors, and perhaps it has become deranged by the explosion."

"Is that possible, Longstrom?"

"Yes, sir. Even normal computor banks would be thrown out of alignment in such a case."

"I see." Harding frowned down at the idiotic features; then, as his eyes drifted over the compact assembly, something dawned deep in his mind. "Longstrom! Would it be possible to transfer the Head to our own vessel?"

"I suppose we could, sir. The pumps feeding the brain with blood and nutrient solutions appear to be intact and the unit is self-enclosed. We could disconnect the feed-in circuits, but . . ." He glanced appealingly at Carter. "Would it be wise, sir?"

"Wise? I don't think I understand what you mean, Longstrom. We have captured a piece of enemy equipment and it is our duty to transport it to base. Frankly, I see no alternative."

"The men won't like it, sir," protested Carter. "We've been away from base for a long time now and morale is low. If——"

"I am aware that you are also our part-time psychologist, Carter." There was no mistaking Harding's opinion of psychologists. "But is it necessary for me to remind you that I am in command? The men will do as I say—and like it."

"Regulations provide that any captured Head be immediately destroyed," said Carter, stiffly. "The danger of panic induced by close proximity with such a thing is well recognised, and——"

"You are insubordinate, Carter!"

"I am intelligent, sir."

For a moment the two men glared at each other, the gun officer momentarily overwhelmed by his knowledge of the inner workings of the human mind, and, because of that, more emotionally sensitive than the captain could ever be. Longstrom moved forward with some vague idea of stepping between them, part of him wondering what would happen if neither refused to back down, knowing that, although Carter was technically right, he was also technically wrong in opposing a superior officer; knowing, too, that Harding was both capable of, and justified in, shooting the psychologist out of hand.

The stalemate was broken by the Head.

It giggled, blinked, parted its lips and, in a peculiarly mechanical voice said: "Object approaching 64:89:221."

It could only be an enemy vessel.

They escaped—just. Longstrom sat at his instrument board, his eyes flickering from dial to tell-tale, from alarm to the moving specks on the radar screens, his hands moving with trained rhythm as he received data, collated it, fed it to the computor banks, using trained skill, technical

knowledge and plain instinct to avoid the probing death of the enemy missiles.

And that was interstellar war.

There were no ships silhouetted in gun sights. No thrill and pulse of combat, exploding ruin caused by the pressure of a trigger, the excitement and adventure of pitting life against death. There was waiting and silence and the slow movement of specks on a screen. There were clicking relays and glowing tubes and mechanical prediction. It was a game in which one man controlled the moves and the rest sat and looked on, knowing that if he guessed wrong, they would spill their lives into the void. No thrill. No glamour. No personal participation. Just waiting.

And so they waited while Longstrom sweated as he tried to guess where the atomic missiles would be. They waited as Carter fired their own messengers of death towards a segment of nothingness and hoped that they would arrive at the same time as the enemy ship. They waited, nerves tense, breath rasping in their throats as they lived in imagination a thousand deaths, from the ripped hull and escaping air to the remote, but always possible, triggering of their own pile by the streaming neutrons of a too-near explosion.

They waited—and the Head waited with them.

Longstrom tried to ignore it, tried to forget the insane rush of uncoupling the feed-in connections, the sealing and transportation of the monstrosity from one ship to the other. It rested behind him in the control room, Harding to one side, tense as he watched the screens, Carter on the other, his delicate fingers poised over his firing buttons. And of them all, only the Head didn't seem afraid.

It giggled, rolling its eyes as it tried to focus on the winking lights and flickering dials, dribbling and mouthing like the new-born or the insane, and, somehow, Longstrom had the impression that it would welcome death.

He sighed as the last crawling fleck vanished from the screens, leaning back and rubbing the ache from his fingers. Harding grunted, emotionlessly, and yet with his usual hint of disappointment, then thumbed a button and spoke into the intercom.

"Red alert ended. Normal stations." He stared at his computor man. "Why didn't we destroy the enemy?"

"The usual reason. Their computors are too good, ours not good enough." Longstrom shrugged. "If we could carry another five tons of computor equipment maybe we'd be able to do better, but until then we've got to rely on luck or two ships to their one." He felt too tired to be formal.

"Our computors are the best we can carry," reminded Harding. "And sometimes we can wreck them; we've just come from a ship so wrecked. How do you account for that?"

"Luck."

"An unknown quantity. I want a better answer than that."

"I can't give you a better answer—sir."

"I see." Harding frowned at the ranked dials. "Don't misunderstand me, Longstrom. I'm not holding you personally responsible, but these conflicts seem to form a pattern. I want to know what determines that pattern. Just why aren't we equally matched?"

"Reaction time." As always after a battle, Longstrom felt a little light headed from too much concentration for too long. "The way things are I have to collect data, judge it, collate it, and act upon it. If I'm good, then we live, and sometimes we even manage to win. If I'm bad, then we die. The most anyone can hope for is that I'm average, and that no harm will be done. That applies to all computor men on all Terrestrial ships. It will continue to apply until such time as we get wholly automatic computors aligned with the ship controls, and by that time human crews will be unnecessary anyway."

"Don't the enemy have reaction time trouble, too?"

"No. Not as we do." Longstrom glanced at the Head, knowing that the captain already knew the answers and vaguely wondering why he was asking the questions. "They have solved the problem of weight in a very efficient manner. The human brain is probably the most compact computor ever devised; they know it, and they use it." He looked away as the Head rolled its eyes towards him. "They take a man, a prisoner or a captured colonist, and they operate on him. They retain the brain, merely keeping the skull, eyes and ears, throat and tongue for convenience, and they fit the severed neck with a glorified Lindenburg-Carrel pump. Then they sever the cells

containing the seat of 'emotion,' cauterise those determining personality or 'ego,' and wire the rest direct to the feed-in circuits." He shrugged. "You then get a highly efficient computor, able to correlate data and act on it at the literal speed of thought. More than that, you also get a self-repairing mechanism, able to respond to vocal orders and to volunteer information. You lose a man in getting it, of course, but that doesn't matter—if you're an alien."

"The swine!" Carter looked positively ill, and Longstrom remembered that he hadn't been long in space. "To do a thing like that!"

"Emotion is misplaced energy," said Harding, coldly. "The enemy do it, but we must never forget that the enemy are *alien*." He stared thoughtfully at the Head. "It would be a good idea to show a thing like that to every new recruit, to every man in space if it comes to that, to warn them what to expect if they allow themselves to fall alive into enemy hands. That man there was a coward; he should have died fighting."

"He should die now," snapped Carter. "To keep him alive is sheer cruelty. The regulations . . ."

"I know what the regulations state, Mr. Carter. I know, too, that we are in this war to win, not to act like gentlemen or gutless whiners!" Harding stared at Longstrom. "How much does our computor equipment weigh?"

"Seven tons."

"And the Head?"

"About half a ton, with pumps, of course."

"A difference of six and a half tons. Not to speak of speeded responses and higher efficiency." Harding nodded. "That difference in weight would mean quicker manœuvring, less mass to hinder the thrust, greater storage for missiles. We wouldn't have to carry huge stocks of replacement parts, instruments and multiple circuits." He smiled. "How long would it take to connect it to our equipment?"

"What?" For a moment Longstrom couldn't believe that he had understood correctly. "You can't connect that thing here!"

"I asked you how long, Mr. Longstrom. I didn't ask for your unthinking stupidity. Let me put it this way. Could we connect it?"

"Yes."

"Even though it has been designed for use on an enemy ship?"

"It makes no difference. Radar impulses are the same; they have to be, or they wouldn't be radar. Electronic circuits are basically similar, and velocity and range are pure definitions, not arbitrary. There could be subtle differences, of course, mostly due to different methods of connecting." He stared at the captain. "If you want to know whether or not this thing could run our ship, the answer is yes."

"You can't do it!" Carter stepped forward, his hands subconsciously tightening into fists. "You can't keep a thing like that alive."

"No?" Harding stared at the psychologist; then, his eyes twin points of frozen ice, glanced at the officer's clenched hands. He nodded as Carter flushed and spread his fingers. "That's better. For a moment I thought that I should have had to order your arrest. You know the penalty for striking a superior, Carter?"

"I had no intention of striking you."

"You know the penalty for insubordination?"

"I had no intention of striking you—sir."

"I'm sure you hadn't, but I'm equally sure that if you continue opposing me you will live to regret it. This is war, Mr. Carter, and junior officers are expected to remember that."

"I'm sorry, sir, but what you suggest is too horrible. The men . . ."

"I have already given you my opinion on the men." Harding stared at the instrument-littered room. "At the moment I am only interested in efficiency—and in killing aliens. Once we clear this stuff away, dump it into space, we can go hunting. Once we have shown that we can destroy the enemy there will be no question of reprimand for what I have done. On the contrary, I will probably receive a medal." He glanced at Longstrom. "Begin the transfer."

"No!" Carter stepped forward and pushed the computor man back into his seat. "You can't do it!"

"Can't?" Harding didn't raise his voice, but something in his eyes told Longstrom that the psychologist was going too far.

"We're not certain that it will work," he said, hastily. "If the enemy discover us with our computors dismantled——"

"They mustn't, and it is up to you to see that they don't."

"There may be unforeseen snags. The Head may not

work with our type of equipment."

"You have already told me that it will." Harding stared coldly at the computor man. "What is your real objection to making the transfer?"

"Common humanity," stormed Carter. "Only a beast or a madman would even think of it."

"Stop it, Carter!" Longstrom stepped in front of the raging psychologist. "My objection is a simple one, sir. If we try the transfer and it doesn't work, what do we do then?"

"A good point. Make the transfer then, and retain our own equipment until the Head has proved its worth." He rose and stepped towards the door. "I want no failures, no excuses, and I want the job done as soon as possible. Do it!"

The Head giggled at his departing back.

It took a full day to make the transfer, and another three to test the responses and reflexes of the captured unit. Then, despite Longstrom's protests, Harding ordered all the original computor equipment cast into space.

"It's a mistake," said Longstrom to Carter one watch period. "It's too much like putting all your eggs in one basket. I'm worried."

He was, too, though not for the apparent reason he gave the psychologist. He was in the position of a computor man without any computors to operate, and he had the sick conviction that, logically, he would be the one ordered to take care of the Head.

"I'm worried, too," said Carter. "I know what's behind all this. Harding wants to prove something, and if he does, can you guess at what will happen next?"

"He'll get a medal—if they don't shoot him for breaking Regs."

"They won't do that; he was right when he said that it was results which count. No, I'm worried that he will prove himself right, that the Head is better than our own computors."

"It is."

"Are you certain of that?"

"Yes." Longstrom glanced uneasily towards the flesh and metal abortion. The thing was asleep—at least its eyes were closed, though it was doubtful whether it could sleep at all, and it was certain that it didn't have to rid its body of toxins. "The enemy have proved that too often to allow

of doubt. In fact the war really started because they found they could use the human brain in that way and began raiding. To them we're nothing but robots." Automatically he kept his voice low, as if afraid of the Head opening its eyes. Carter looked sick.

"Then I was right. Longstrom! Can you even guess at what will happen, must happen when Harding returns to base after a successful sortie?"

"They'll give him a medal."

"They'll do more than that. If the Head works on this ship, then why shouldn't it work on others? The only reason we don't use them is on purely humanitarian grounds, but once they start to be used . . ." Carter looked really ill. "Human nature is a peculiar thing, Longstrom. We can deny a thing right up to the moment of it happening; then, to rid ourselves of shame and guilt, we can be proud that we use it. The Head is like that. Now we shudder at the thought of it. Tomorrow? The Head could be standard equipment on every spaceship, in every factory, used whenever and wherever a computor is necessary. Why? Because nothing succeeds like success, and once the first man has broken the taboo, the rest will follow."

"You're forgetting something," said Longstrom, drily. "Where are we going to get the raw material? We can't capture all we'll need from the enemy."

"There's nothing about the unit we couldn't duplicate, have duplicated in various stages during medical and surgical research. The only hard part is the brain itself—and we have plenty of those. Criminals. Law breakers. Even volunteers. In a way the Head is immortal, wastage is slow, and with care, the brain should last for centuries. You'll find men and women willing to lose their bodies for the sake of an extended life-expectancy. But that's not what I'm afraid of."

"No?"

"Think of the results of the Head as a punishment. Think of an officer and a ranker. Obey—or else! Not a quick, clean, sudden death, but centuries of lingering half-life as a Head. Wouldn't you think twice before questioning an order?"

"I see what you mean." Longstrom stared at the blank features of the thing topping the humped machine. "I wonder what it thinks about—if it

can think at all. Does it know what has happened to it? Can it feel? Can it understand what is going on around it? Tell me, Carter, how far can conditioning go?"

"Pretty far. Surgery has divorced its emotions and personality, and we can only guess at the techniques of the enemy. Perhaps they left it aware so that they could enjoy its mental suffering. Or perhaps, not knowing emotion themselves, they just didn't think to eradicate it." He sighed. "A pity that it's insane. I should have liked to question it."

"Couldn't we restore its sanity?"

"How? The shock and mental conflict must have been so great that the mind escaped from what it was into madness. If we could bring it back—and that is assuming that the brain is relatively undamaged—then, as soon as it realised what had happened to it, it would go insane again. A vicious circle."

The operative word was vicious.

The water was tepid, the sponge an oozing mass, the soap slimy with long immersion. As Longstrom had feared, Harding had put him in full charge of the computing equipment, and that meant checking the L-C pump, the nutrient solutions, the temperature, ion charge, connections and feed-in circuits.

It also meant washing the thing's face.

He didn't like doing it, but it had to be done. He hated running the sponge over the naked scalp, rubbing it in the ears, gently around the flickering eyes, wiping the drooling spittle from the working lips and cleaning up the mess from beneath the slobbering mouth. Drying the thing was even worse, and each time he did it, the nausea and revulsion grew worse. Revulsion which began to crystalise into a desperate hatred of the man who made him do it.

And there could be no escape.

They had replenished their stores from a transport, contacting at a rendezvous in space, and the ship was loaded to capacity with torpedoes and fuel, power and supplies. Now they were on the hunt, driving deep into enemy controlled space, waiting and watching for the tell-tales to flash and the Head to take over and blast his late captors to dust—they hoped.

Longstrom wasn't so sure.

He lived in closer contact with the thing than anyone aboard; even Carter had found it too much for him, and Harding regarded it as nothing more than a machine. But it wasn't wholly a machine. It had the brain of a man, and as the days dragged past, Longstrom began to wonder.

Would the enemy have left it intact without reason? Would they have left it at all if it were so valuable? And how was it that he had managed to wreck the enemy vessel even though they had a supposedly more efficient computor?

Gingerly he finished the washing, dropped the sponge into the bowl, and reached for the towel. Accidentally, trying not to touch the bare skin, he jabbed his thumb into an eye and just managed to snatch his hand from gnashing gums.

"Take it easy, Jack. You want to blind me?"

The words were blurred, liquid, oddly mechanical, but unmistakable. He jerked away from the Head, staring at it, the capsized bowl sending a film of water over the glistening floor plates.

"You spoke!"

"Sure I spoke. I . . ." The eyes rolled and muscles jerked beneath the flaccid skin as the Head lolled on its metal and plastic support. "What's the matter with me? I can't move!"

"Steady." Longstrom forced himself to step nearer and rest his hands on the jerking skull. "You've had an accident. We had to put you in stasis so that you can't move. You'll be all right soon."

"Is that it?" The Head ceased its jerking. "So you picked me up, eh? Earth ship, too. That's good. For a while back there I was afraid it was an enemy ship."

"You're among friends now." Desperately Longstrom hoped that Harding would enter the room. If the captain could hear the Head now, while it was speaking rationally, then he could never refuse to do the logical thing. "When was it?"

"When was what?"

"When did you . . " He realised his mistake as soon as the words spilled from his mouth. The Head whimpered, twisted until it contorted with the pain of its tearing tissues, and the staring eyes grew wild with shocked understanding.

"You didn't pick me up! If you had you'd have known when it happened. Oh, God! So it was an enemy ship after all."

"Steady!" Longstrom

gripped the Head in both hands to keep it from rupturing the flesh and plastic join by the violence of its motions. "We're friends I tell you. Friends."

"Then kill me. If you love God then kill me. If you hope for mercy or salvation, kill me. Make an end. For God's sake, make an end!"

"*You know?*"

"I know. I keep coming back, keep thinking that I've been asleep, that I'm normal, with a body instead of a machine. I keep trying to move and then I can't move, and then they come and do things to me, and . . ." The drooling voice dissolved into formless screams, the eyes glazed and as the screams faded into insane mumblings, Longstrom had the mental impression of a damned soul running shrieking down the endless, twisting corridors of hell.

"They'll never get *me*," he whispered, sickly. "They'll never take *me* alive."

He wasn't surprised to find that he was soaked with sweat.

They met the enemy two days later.

Harding grunted as he saw the flash from the alarm and his finger stabbed the intercom button as he slipped into his chair.

"Red alert. Enemy sighted."

Carter licked his lips as he took position, little beads of sweat shining on his face and neck, his hands quivering with tension. Longstrom felt like an unwanted dog.

He had nothing to do.

Always before he had been the busiest man on the ship in time of combat. He had concentrated on his instruments, trying to join himself to the relays and the scanners, sensing the flow of current and trying to anticipate, by just that fraction faster than the enemy, and so gain the advantage. Now the Head had taken over and there was nothing for anyone to do.

"Object approaching 34:56:298." The voice was mechanical, lifeless, disinterested.

"We'll get them this time," gloated Harding. "They will be relying on our time lag and poorer computation." He glared at Carter. "Keep your hands away from the firing controls. You're there to check, not operate."

"Yes, sir""

"Sit down, Longstrom. Watch the screens and try to anticipate. See how near you

can come to emulating the expert."

"Yes, sir."

"Object now 34:53:277."

"Getting nearer." Carter dabbed at his streaming forehead. "Damn this waiting!"

Longstrom knew just how he felt. He wanted to get to work, feed data into the discarded computors, guess, check, feel the rising tension and mounting excitement as the time came to fire, *now;* and then the artful manœuvring, the evasive action, the gamble against death. And if the waiting was bad here in the control room where they could see what was going on, then what must it be like for the crew?

He knew the answer. It was hell. They waited in semi-darkness, those men, standing by in the dull glow of the non-radiating emergency battle lights, ready to load the firing tubes, to activate or dampen the pile, to slam bulkheads or seal a rip in the hull. They wore no suits, for suits would hamper, and when they moved they would have to move fast. They waited while nerves jumped and quivered with the sheer strain of doing nothing. They would taste their own sweat and their own blood. They would tremble on the verge of insanity and breaking morale, and then, when it was all over, they would be exhausted and irritable, burnt out and temporarily useless, aged and worn by sickening tension.

"Object now 34:39:198."

"Straight-line flight path." Harding stared at the screen. "If we had fired at the moment of sight we'd have got them by now."

"Long range," said Longstrom. "Anyway, they would have registered our missile and dodged it."

"Object 79:24:389."

"Another of them!" Harding glared at the second fleck on the screen. "Damn! They'll have us in cross-fire."

"Not if we move." Longstrom glared at the drooling features of the Head. "What's the matter with that thing? Why doesn't it do something?"

"Object one now 34:27:119. Object two now 79:14:276."

"Coming fast." Carter rested his hands on the firing controls. "Shall I send out a rover?"

"Wait!" Harding scowled at the twin flecks of light. "They haven't fired at us yet; maybe they haven't spotted us. I trust the Head. Hold your fire."

Abruptly the ship moved. It

jerked with a surge of acceleration, its venturis glowing with betraying fire, spinning and lunging directly towards the approaching vessels. Harding swore, slapped at the controls, then relaxed as flame blossomed in blue-white incandescence behind them.

"See? It spotted the sneak-torps and dodged. Could you have done that, Longstrom?"

"Maybe." The computor man frowned at the screen. "Why doesn't it fire?"

Again the ship jerked, slamming soft flesh against unyielding metal; then, as it steadied, the muffled roar of the firing tubes pulsed through the control room.

". . . eight . . . nine . . . ten. Ten! Can it handle that many?" Carter looked at the idiot-features, then hastily stared away.

From then on the Head took full command.

It was efficient—even Longstrom had to admit that. It stared at them with its vacant features, while, in the computor areas of its mind, data flowed and was correlated, velocities checked against range, spacial co-ordinates and missile fuse factors assessed and determined, ship acceleration aligned to evasive action; and always, as the screens became thick with crawling flecks of light, the idiot voice droned the co-ordinates of the enemy vessels.

It destroyed the first one within the first hour.

It almost destroyed itself five minutes later.

Longstrom saw it in time, a creeping speck carrying within itself the pure flame of atomic destruction, and even as he saw it, he had knocked Harding from the pilot's chair and had grabbed the manual controls. Death missed them by ten miles and, even as he relaxed, a second missile probed towards them. Tensely he waited for the Head to recognise the danger and take over.

It didn't.

Harding swore then, words which he had learned a long time ago, and which none of them had ever heard him use. He sat at the manuals, his hands white-knuckled as they gripped the slow, too slow, levers, and desperately he tried to blast the ship away and free of the probing torpedoes. With computors they could have done it. With the equipment he had discarded Longstrom could have assessed the co-ordinates and determined the escape route, but without them there wasn't a hope.

The first hit destroyed the main drive and left them helpless. The second ripped away the rear section of hull and spilled men and air into the vacuum. The third hit was due in sixty seconds' time unless a miracle happened.

"You swine! You dirty stinking cowardly swine!" Harding swung towards the idiot face of the Head and his hand slammed against the flaccid cheek. "You . . . You *thing!*"

"Stop it!" Longstrom grabbed at the captain's arm and was flung aside. "Stop it!"

"The death wish," babbled Carter. "That's why we were able to wreck its original ship. It wants to die."

"I tried to warn you," shouted Longstrom. "I tried to tell you, but you wouldn't listen. You would insist that it was only a machine. You wouldn't admit that it was *human*." He stopped then, staring in horror at what the captain was doing, sick at the sight, and yet, despite his sickness, knowing that it was what should have been done long before.

Harding was killing the Head.

He was killing it as he would kill a man, his big hands wrapped around the shortened neck, his thumbs digging into the windpipe, his lips drawn back in an animal snarl as he twisted and wrenched. Squeezing its throat wouldn't kill it, of course; it didn't need air to live, but, as Longstrom saw the glistening red droplets oozing from around the plastic collar, he had a sick premonition of what must happen.

The join could be nowhere near as strong as a normal neck.

He ran, then, tearing open the emergency doors and unsealing the tiny hatch, with Carter screaming behind him, and Harding snarling his foul-mouthed curses. He kicked the psychologist away, slammed the outer door, and almost fell into the officer's escape boat. It was small, just big enough for three and able to blast clear and drift towards the safe sections of space, where he could be picked up by a Terrestrial ship. He was babbling as he sealed the inner door, his hands trembling with fear at the thought of the approaching torpedo, or worse, the approaching aliens eager for new computor units.

The acceleration knocked him out so that he didn't see —the spreading flower of blue-

white flame where the ship had been. He remained unconscious as the tiny ship drove towards distant safety, and only awoke to the blare of the alarms and the dim silhouette on the damaged screen. A ship! But friend or enemy?

He stared at it as it swung closer, alternating between hope and despair, wanting to stay alive so that, in the event of it being a friend, he could warn all commanders of the danger of captured computor units with their booby trapped conditioning and overriding death-wish.

But if it were an enemy?

He shuddered at the memory of the Head, hearing again its desperate pleading for death, its sick realisation of what had been done to it and what it was. Enemy or friend? To die or to live?

The ship came nearer.

The man on the narrow white bed sighed, stirred, feeling his muscles relax as the stasis wore off, waiting a moment with closed eyes, his brain alive with recent memories. The technicians watched him through their one way glass, ready to throw him into stasis again if necessary, yet hesitating until the last moment.

"I hope he makes it," said the elderly man to the younger one at his side. "Three suicide attempts should be enough for anyone."

"Three and no more." The young man shrugged. "A funny case, that. Picked up in space, raving and out of his mind; promptly tries to commit suicide and refuses to respond to mental-recall therapy. You'd think that he'd get rid of what was troubling him after he'd re-experienced it a few times, worked off the emotional charge and realised that it was all over." He leaned a little closer to the glass. "I sure hope that he makes it this time."

"You know what will happen to him if he doesn't, don't you?" The elderly man sounded disgusted. "As he's insane the higher ups think it won't matter, anyway, so they've the bright idea of converting all the insane into computor units, based on those used by the enemy. What a way to win a war!"

Intently they watched as Longstrom opened his eyes, stared in horror at the surgically white ceiling, then frantically looked around until he found the knife.

The young man sighed as he projected the stasis.

FICTION

KEMLO AND THE SKY HORSE is obviously for the very young. It is a tale of life on artificial satellites where the children are born being able to live in space with no space suit. This must raise interesting problems—as well as eyebrows—with their parents, who, born on Earth, do not have this power. Whenever these children see their parents, one or other must be space-suited. The older satellite children are "Scouts" and have their own scooters, in which they can go for miles in space, and some of them build a plastic horse on which they can ride. This horse resembles Pegasus and is all very romantic and juvenile. Written by E. C. Eliott and published by Nelson, (36 Park Street, W.1) at 5s.

SHADOWS IN THE SUN is, we think, Chad Oliver's first novel, He has made a very fine, exciting and suspenseful job of it. This is true science fiction, with none of the vapid thrills so often associated with the genre. The tale is about Jefferson Springs, a strange sort of Texan town where Paul Ellery is doing anthropological research. Turns out that his research is not *anthro*pological after all, and that's the only clue we'll give to the unfolding of this brilliant little book. You buy it; you'll like it. From Ballantine Books (404 Fifth Avenue, New York, 18, N.Y., U.S.A.) at 35 cents.

THE SECOND ASTOUNDING SCIENCE FICTION ANTHOLOGY, edited by John W. Campbell, Jun., comes from Grayson

and Grayson (16 Maddox Street, W.1) at 9s. 6d. It contains: *E for Effort* by T. L. Sherred, *Cold War* by Kris Neville, *Vault of the Beast* by A. E. van Vogt, *Historical Note* by Murray Leinster, *Clash by Night* by Lawrence O'Donnell, *Meihem in ce Klasrum* by Dolton Edwards, *Late Night Final* by Eric Frank Russell, and *Protected Species* by H. B. Fyfe. These are all good stories, well-deserving preservation between boards.

A BOOK OF STRANGE STORIES, selected by Herbert van Thal and published at 2s. by Pan Books (8 Headfort Place, S.W.1), contains thirteen stories by recognised masters of the art. These are not science fiction (and neither publisher nor compiler suggest that they are) but they are worth your time, nonetheless—if only to see how really imaginative fiction can be written in a really erudite manner.

DOWN TO EARTH, by Paul Capon, is exciting and fast-moving, but it is a gangster story with a few science fiction trimmings. A newspaper finances a spaceflight, and the spaceship is not heard of for five years. The book deals with all the intrigues on Earth between the first communication received from the adventurers and their actual landing in Hyde Park. There is a lot of shady dealing and a couple of murders. Some people (including the publishers) might think that this is science fiction. The book is published by Heinemann (99 Great Russell Street, W.C.1) at 9s. 6d.

If Charles Chilton's JOURNEY INTO SPACE was really a record-breaking radio serial, as its publishers state, then it is certainly not at its best as a novel. (We hadn't the courage to listen to the broadcasts, after what we'd been told about them.) Four men—whose conversations consist mainly of the Christian names of the other three—have some impossible adventures on the Moon and on the Earth. Space, time, flying saucers, voices and several kitchen sinks come into the story in

a quite vague and disconnected way. For the life of us, we *still* don't know what it's all about. Published by Herbert Jenkins (3 Duke of York Street, S.W.1) at 9s. 6d.

OUT INTO SPACE is also for the very young. It would do as a bedtime story. Two children stay with their astronomer uncle and learn about the Moon, planets, space travel, etc. But probably no children nowadays talk in so ridiculous a fashion, or know so little about the subject. Authors Patrick Moore and A. L. Helmhave get over quite a bit of information; but the manner of their doing it and the illustrations they've used puts the book in the not-recommended class. The cover and the title seem to have little bearing on the tale. It is published by Museum Press (26 Old Brompton Road, S.W.7) at 9s. 6d.

NON-FICTION

Marguerite Allotte de la Fuye is apparently a relative of (or at least has the same surname as) Jules Verne's mother, and has written a very readable biography of JULES VERNE. The French version has been translated smoothly by Erik de Mauny. Verne appears to have been a fiery, temperamental practical joker, a law student, a sailor, a playright, and a poet as well as a successful author. He led a very colourful life that comes over clearly and fascinatingly in this excellent book. It is published by Staples Press (Mandeville Place, W.1) and costs 12s. 6d.

MAN AND THE PLANETS is a wonderful little book by Robert S. Richardson, of Mount Palomar Observatory. It's all about the solar system and ideas regarding it, present and past. Splendidly illustrated, it is not really too expensive at 15s. from Frederick Muller (Ludgate House, 110 Fleet Street, E.C.4).

In BIOGRAPHIES: SCIENTISTS AND INVENTORS there are potted life-stories of eighteen people who have helped to make the world as we know it—the Herschels, Edward Jenner, Sir Humphrey Davy, Michael Faraday and Sir

Henry Bessemer are, perhaps, the best known. This is not a large book; there are only a few pages about each person, but it is full of facts put in a readable way. It is written by William Freeman and published by Isaac Pitman (Parker Street, Kingsway, W.C.2) at 7s. 6d.

BIOCHEMISTRY is the latest title in the Teach Yourself series and a fine addition it is. P. H. Jellinck of the Middlesex Hospital has accomplished the near-impossible of making this subject clear to anyone who knows a little chemistry and biology. The fascinating story of living chemistry is told with precision, accuracy and verve that will attract many who might think the subject boring. Try it, will you? It costs 6s., from English Universities Press (St. Paul's House, Warwick Square, E.C.4).

PHYSIOLOGY, that tried and trusted title in Livingstone's Catechism Series, has now seen a 6th edition, revised and rewritten. The whole subject is covered in quite extensive detail, presented in the intriguing form of answers to specific questions. At 12s. 6d. (12s. 11d. by post) this book must be the cheapest that contains so much information on this subject. Very highly recommended. From E. and S. Livingstone (16 Cheviot Place, Edinburgh).

SCIENCE NEWS NO. 34, is another Penguin good buy for only 2s. It contains three long articles of special interest to our readers—The Energy of Stars, Interstellar Material, and Uses of Mass Spectrometers. Other pieces are about mind and matter, biological individuality, mathematics in industry, the boiling of liquids, and insect pigments. A most interesting number, this. From Penguin Books, Harmondsworth, Middlesex.

J. B. Rhine's THE REACH OF THE MIND is particulate. Part one sketches a short history of ESP; part two gives details of current experiments in ESP and PK; part three tries to show where greater knowledge of these subjects

might lead us. The whole book is most fascinating reading, even if one's credulity is tried a little. Rhine's subjects—if you can believe the statistics—actually influenced the way in which thrown dice came to rest. Here we have the most complete and up-to-date account of American ESP work. It should be part of the library of anyone interested in the subject. It is published by Penguin Books (Harmondsworth, Middlesex) at 2s. 6d.

In SPACE, GRAVITY AND THE FLYING SAUCER, Leonard G. Cramp tries to explain how the flying saucer may work. Some of the old faithful sightings are given again, together with one that a boy of thirteen saw and photographed in Lancashire in February, 1954. This photograph is compared by orthogonal projection with one of Adamski's (of *Flying Saucers have Landed* fame) and Cramp comes to the conclusion that they are genuine, mainly because they fit his design! He tries to be fair in his criticism of "non-believers" but leaves us with no doubt as to his personal bias. Still, the book is worth reading. Though whether it is worth the 10s. 6d. asked by Werner Laurie (1 Doughty Street, W.C.1) is a moot point.

MINDS AND MACHINES, by W. Sluckin, is, as you would expect from the title, a book about electronic brains and their similarities to the human mind. Published by Penguin Books (Harmondsworth, Middlesex) at 2s., it is most highly recommendable as a very thorough introduction to this subject. From basic principles, the author takes us up to quite an advanced level, making the whole thing clear and precise, and giving us a greater insight not only into the marvels of modern calculating machines, but also into the workings of our minds. Essential for all serious science fiction fans.

FANZINES

BRENNSCHLUSS has three editors—Ken, of 5 Furness Street, Marsh; Dave, of 4 Coverdale Road, Marsh; and Irene, of 45 Worcester Avenue, Bowerham, all of Lancaster. The issue to hand seems a little vague: no surnames are used for the editors, no issue number is apparent and the subscription arrangements are obscure, but the editors seem friendly and are probably prepared to help. The fanzine is well up to standard. This issue contains even another Manchester Convention report. This is not very amusing and is hardly worth including so long after the event. The cover is quite good but the interior illustrations are very poor; we couldn't see the point in most of them—if they have a point. Most of the wording is very clear, although it has, apparently, been cut by Irene, who says she is a beginner at this sort of thing. She's doing all right. There are several articles, a short letter column and a film review.

DIZZY is the new, all-cartoon fanzine put out by Don Allen (of *Satellite* fame), 3 Arkle Street, Gateshead 8, Co. Durham. It contains twenty pages of cartoons, some of which are old jokes, some new and some good. *Dizzy* is combining with *Satellite* for the Christmas issue, and will then cost 1s. 6d.—normally it costs 9d. Some of the drawing is good and some of the reproduction matches it. We feel that Don has achieved something with all his cartoons.

PEON is a clearly printed, sane fanzine, published by Charles Lee Riddle, 108 Dunham Street, Norwich, Connecticut. It costs 10 cents per

issue or 12 issues for $1, or 7s. for 12 issues, to be sent to Fred Robinson, 63 Newborough Avenue, Llanishen, Cardiff, Glam., South Wales, or to John Gregor, Newhaven Street, Everton Pk., Brisbane, Queensland, Australia. In No. 33 there are stories, fanzine reviews, news articles (one by Isaac Asimov), book reviews, a poem, "for sale" pages—all nicely produced. American in interest, but all interesting.

ALPHA starts off well with a lovely cover by Ben Abas, but the contents are not, perhaps, quite up to their usual high standard. It is edited by Dave Vendelmans, 130 Strydhoflaan, Berchem, Antwerp, and, for a year's *Alphas*, 4s. or 60 cents (in stamps) should be sent to Harry W. Roscoe, L. Beeldeken sstr. 124, Antwerp. No. 7 contains all the usual fanzine features and pages of readers' letters (headed "Postage to Europe—4d.!"). Magazine and fanzine reviews are plentiful, too. This fanzine is one of the easy-to-read ones.

HODGE PODGE is one of the finest fanzines we've ever had the pleasure of reading. Number 12 came to us by courtesy of Stuart Mackenzie, editor of *i*, and we are grateful to him for introducing us to this most sensible, sane, amusing fanzine. It is published by the Share girls—Nancy (Hodge) and Marie-Louise (Podge)—from P.O. Box 31, Danville, Penna, U.S.A. It is available to overseas fans if they send a letter of comment or some material for publication. One of the nicest things about it is that it is international in scope. Much of its contents are written by European fans—unlike most American fanzines, which are rather insular. And the contents are good. Some of the poems are the best fan efforts we've seen. Here and there the illustrations are *hand-coloured* and very well done. A splendid job, Hodge. Nice work, Podge.

i really hit us in the eye with its third (Christmas) issue. This, surely, must be the biggest and best fanzine issue ever published—120-odd

pages, including: a 20 page literary supplement all about books and magazines, with reviews by Francis Arnold and a check list of "Lost Land" stories, by Fred C. Brown; a 14-page pantomime (*Fanderella*), by A. Vincent Clarke; a long serious piece on obscenity by Sid Birchby; a Gunner's Code, designed to control the childish use of water pistols; a dozen pages of quite fine poetry; a booklet about getting your name known in fandom; a piece in praise of ballet, by Stuart Mackenzie; a kind of Scrooge-up-to-date tale, by Charles Grey (Requiem); a fanciful history of fan myth, by Ted Carnell and Donald Wolheim —and on and on and on. There are ten different colours of paper, not including white. There are many (but not *too* many) illustrations of competent calibre. And the whole enormous wad costs only 2s. Editors Stuart Mackenzie, Ted Tubb and H. Ken Bulmer are to be soundly congratulated on producing a mammoth, intelligent, neat and thoroughly worth-the-cost issue. It can be obtained from 5 Hans Place, London, S.W.1. Future issues may be obtained at 1s. 6d. each, in advance, or 6s. for the year.

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Do people call you a conversational bore? Are you given over to idle prattle, such as: "it's a nice day," "have you heard about Mrs. So-and-So's operation" or other tiresome "small talk"? Yes, your conversation may stamp you as a social C.B.

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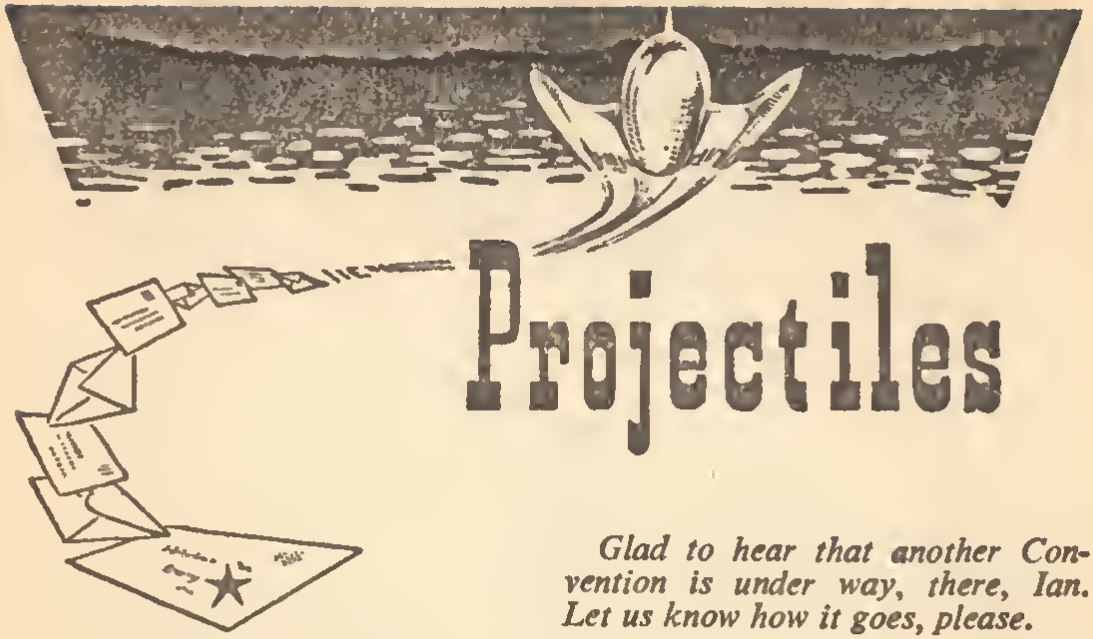

Projectiles

OVERSEAS SECTION

AUSSICON

The Fourth Australian Science Fiction Convention will be held on Saturday and Sunday, March 18th and 19th, 1955. The programme will include talks, original dramatic presentations, displays, etc., and will open with a Fancy Dress Ball. Science fiction artwork and short story contests are being held in conjunction with the Convention, the latter for a short story of 3,000 to 8,000 words to be published in the Souvenir Booklet. For any further information on the programme, contact either myself or the secretary, Mr. Arthur Haddon, Box 56, Redfern, N.S.W., Australia. Overseas fans are welcome to join the Convention for a fee of 10s. Aust., $1.00 U.S., or 8s. Stg., which will get them on the roll, and a copy of the Souvenir Booklet and the Convention Report. Advertising space is available in the Souvenir Booklet. Ian J. Crozier, 6 Bramerton Road, Caulfield, S.E.8, Vic., Australia.

Glad to hear that another Convention is under way, there, Ian. Let us know how it goes, please.

TROUBLE

I find it difficult to stop chuckling over G. W. Walton's letter, published in issue No. 49. The editorial comments were superb and the combination approaches classical stature. Poor Mr. Walton—strange that with such an address as Banna Boo he should be so totally lacking in imagination. But I have troubles of my own. I prize my collection of *Authentic* most highly and lack only issue Nos. 3 and 6. I am willing to trade some old *Astoundings* or *Weirds* if any of your readers are interested.
Dale R. Smith, 3001 Kyle Avenue, Minneapolis 22, Minn., U.S.A.

Many people have this same kind of trouble, Dale—early Authentics *are darned hard to find. Still, we hope somebody will take pity on a poor American fan and send you their prized back numbers. Keep chuckling. Stops the ulcers coming.*

EXEUNT

I have been an avid science fiction "addict" for as long as I

can remember; in fact, on looking back over the years I would say that I grew up with it, or perhaps *it* grew up with me. During my school days *good* science fiction was virtually unknown in this country and *any* form of it was rare—not that the quality or maturity of the work interested us in those days, of course. As far as *Authentic* is concerned, I have been a regular reader for only about two and a half years, and during that time have seen it grow from a very mediocre publication to the position it now holds. I am not saying that it is the very best S.F. mag, by the way. You frequently invite constructive criticism from your readers, so as this is the first occasion I have written to you (or any other S.F. editor) I shall now list my likes and dislikes where your mag is concerned. Firstly, on the debit side:—1, Less stories of the "Mary Hell's" variety, *please.* 2, Either more illustrations or else go the whole hog and eliminate them altogether, as there doesn't seem much point in only having one (usually pointless) picture in the entire book—this is one point where *Authentic* lags badly behind its competitors. 3, Why not eliminate your "Fanzine" and "Society" reviews from overseas editions as these are of no interest to us. You could then get yourselves an overseas correspondent and use those pages for articles on developments out here and in other countries in which you circulate.

Now the credit side:—1, Covers —the best of any. 2, Factual articles—very interesting and usually well written—keep them up. (However, I do think Mr. Byford—No. 49—wants to measure the distance from Earth to Moon with greater accuracy!) 3, Policy—very good. One of the few publications to encourage new authors while, at the same time, keeping in a proportion of "name" writers.
A32253, Sgt. Pinson, E. (R.A.A.F.),
c/o Staff Mess, L.R.W.E.R.,
Woomera, Australia.

Thanks for your comments, Eric, but we're saddened to know that you don't want to keep in touch with fan activities. Wouldn't it help you to forget the sand? How's the guided missile work going?

NZ CLUB

The Christchurch Science Fiction Club members wish to make a most generous offer: that is to offer to SF fans in hospital and other institutions a free parcel of SF books. We have about 3,000 back issues on hand and about 300 coming up each month, so if you can give us any addresses that you might have, we will be glad to send them a parcel. Each parcel will contain one of each of the best SF mags. I hope you will take this as a goodwill gesture from the ChChSFClub, and all our 52 members wish me to convey their best wishes for *Authentic* and hope you will keep up your good standard in the *best* SF mag of them all.
G. Sarchett, 2 Curries Road,
Hillsborough, Christchurch,
New Zealand.

Glad you managed to form your club, Mr. Sarchett. Keep us informed of your progress, will you? One very deserving type we know—a victim of paralysis, but cheerful withal—is Bill Warren, 615E Block, El Dorado, Arkansas, U.S.A. No doubt our readers can let you know of others. Stay kind always, won't you?

MOVE

I want to inform you that the "offices" of DIMENSIONS have moved to a new location in the editor's college town. This is:
Harlan Ellison, 55 East 13th Avenue, Columbus 1, Ohio, U.S.A.

Thanks for telling us, Harlan. Still smoke that enormous pipe?

HOME SECTION

NASTY

You are in trouble with me—about Mr. Walton's letter. While I don't agree with him, there was no need for you to be so nasty; it leaves a bad taste in the mouth. Most of your parenthetic comments were just carping and silly—I won't dignify them by terming them "supercilious"—and would, I think, tend to alienate other readers. As you know, I'm all for a lot of shorts, but when you put out a long one, make sure it's a really good one, and a bit of a change from the recurring mutant superman theme. (Apply that in the widest sense.)
Paul L. Sowerby,
21 Lansdowne Road,
West Didsbury, Manchester 20.

Go on, Paul! Where's your sense of humour? We hate being nasty, but sometimes we have *to be—and it was rather fun, wasn't it? (Now work that out!)*

FIRST

This is my first-ever letter to an editor, and I'm not quite sure how to address you. As a neofan of the opposite sex (*I'm* female) I do correspond with one or two fans; I have written for Femizine (Nos. 2 and 3), have also written for Phantasmagoria, which, unfortunately, arrived too late for publication. I sub to *Eye* and *Hyphen*. I have *never* yet met another Huddersfield fan, but I did visit the Supermancon and have met several of the Manchester crowd. In fact, I was at the Thatched House last night, having had tea with Frances Evans. I buy all SF mags and books and I read them. Women aren't very good usually at maths, and technical stories are beyond me—I liked best in 50: *One Hour*, *Won't Power*, and *The Kid*, which is an unusual choice for me as I'm a Ted Tubb fan, but certainly *Hidden Treasure of Kalin* isn't one of his best efforts. I am hoping to get to the Easter Con. Please remember you have one or two SIMPLE readers who aren't budding Einsteins—but all the best for *Authentic*.
Irene Boothroyd, 10 Millside,
Colne-bridge, Bradley,
Nr. Huddersfield.

Simple? Are you blonde, too? See you at the Easter Convention!

IDEAS

I am not a regular reader of your magazine, but I bought the October issue yesterday because of its most attractive cover. I haven't read any of the stories, but liked the articles and features. If you abandon the wretched pocket-book size for more respectable dimensions, and, moreover, continue to produce covers like this, you are in serious danger of acquiring another regular reader. The main purpose of this letter, however, is to criticise Professor Delwood's' article on the expanding universe. I must

vigorously oppose his statement that this theory has an almost watertight proof. This cannot be so when there are alternative explanations, as good or better, of the phenomenon of the "red shift." Here are four of them:

(1) That physical processes are speeding up in the course of time, the light received from the distant nebulæ having been emitted at a time when these were slower. Professor Delwood actually expounds this alternative, then proceeds to ignore it.

(2) That the reddening of the light is due to loss of energy due to passing through intervening interstellar gas. I understand that many "recessionists" have to admit this at least as a contributing factor.

(3) That this phenomenon is due to as yet unknown factors in the nature or structure of the light photon. There may be internal (sic) processes in light itself over long periods of time.

(4) That the apparent recession of the galaxies is real but not universal. If the universe is an infinite one the region within range of our telescopes is, relatively, infinitely small. Hence we cannot assume that the whole universe is uniform in its behaviour. An interesting point regarding this hypothesis is the revival of the "super-galaxy" suggestion by Soviet astronomers. They suggest that our own super-galaxy could be expanding or pulsating due to laws or processes applying to such systems, not apparent from our microcosmic viewpoint.

The merit of all these alternatives is that they deal with possible properties or organisations of matter and energy, and do not need to call in such abstract and rather metaphysical concepts as "expansion" or "curvature" of an immaterial dimension such as space. One might with equal realism refer to expansion or curvature—or, for that matter, reef-knots—in time. It has been pointed out that if space were actually curved, and it is assumed that galaxies are about uniform in their distribution, then their numbers at the extreme limit of telescopic range will not have increased in accordance with the square law. Hubble thought that he had shown this to be the case, but the report from Mount Palomar, this year, that galactic distances are twice as large as the previous accepted estimate, covers this apparent discrepancy and robs the supporters of a finite universe of any observational confirmation of their theories. While I am in a critical mood I will turn to the little article of yours referring to the cover. Since Venus is a sister world in size, mass, density, proximity and origin, is it not reasonable to suppose its chemical composition is the same, or very similar? Then why not likewise large quantities of water? I am not much impressed by the dust cloud theory. The absence of water vapour lines in the spectrum merely means that it is absent in the upper atmosphere. After all, it is confined to the lowest levels of the atmosphere here on Earth also.

Meredith Chatterton,
63 Pentire Road, London, E.17.

Welcome to the growing fold, Meredith. We are pleased to number such an acute thinker among our regular readers—you are regular, now, aren't you? About Venus—you may be right, but there's no evidence for your view. We must

stick to the evidence, you know. You've certainly given our readers some thinking points with your "expanding universe" ideas. Thanks.

TOP

I have been reading science fiction for over a year, and would like to pay my respects to *Authentic* for entertaining me with first class reading. Unlike most British and American numbers, your magazine isn't merely out to satisfy the readers' thirst for good literature, but is ready to exploit to SF fans any interesting data on up-to-date scientific accomplishments. For this, I class your magazine with the top American science fiction magazines.
Philip C. Watts, Wroxton Abbey, Nr. Banbury, Oxon.

We blush with pleasure, Philip!

HANDBOOK

I read with interest your review of the "Handbook of S.F. and Fantasy," by Donald H. Tuck. You say its entries are classified "according to story, author, magazine and pocketbook." Could you tell me if it deals with the American magazines, please. Since about 1945 I've been collecting S.F., but mainly in the British Reprint Editions. Now that I've been buying some American editions as well, I would like some method of tying up both editions just in case I buy an American mag which has been given a complete British reprint. It seems to be the fashion nowadays to give the editor your opinions and favourite stories in his magazine. I will not do this, but merely congratulate you on your fine efforts in maintaining schedules, and for your contribution to the making of British S.F.
Eric Moore, 10 Dinsdale Street, Ryhope, Co. Durham.

Yes, Eric, it does deal with all the American magazines. Thanks for the congratulations.

MEAT

In your editorial of the 50th issue of *Authentic* you say you want to know what we readers want—well, you asked for it, and if it seems that I want a lot it doesn't mean that I don't think you have a pretty good magazine already. Your non-fiction section is too "bitty." I'd like to see the space used on one decent article which has plenty of meat, for when a magazine comes out only once a month, then one evening's entertainment from it is not enough. As for the stories, they are good, *but* the short stories just aren't written well enough. Apart from one by Bryan Berry about a tree whose title I don't remember at the moment, only Ray Bradbury has been successful at this type of story. Why not be a little more selective? Two or three really first class stories would suit me, and if sometimes you can find only one that's good, well, better that than five that are disappointing. Having read your mag from its first issue I am quite sure you have your eye open for improvements—keep up the good work. Higher standards may lose you a few readers on the way, but will, I'm sure, gain you many more.
3025774 Cpl. Watts, B.,
Box No. 5, R.E.11, R.A.F.,
Honlow, Beds.

That's the way to talk! None of this going down to the masses nonsense. We'll bring the masses up to us—if they aren't already there!

PRIMIFAN

I have been a S.F. reader now since those early days of 1931-2, when my brother and I were avid readers. In those days S.F. was rarely heard of in this country, we had to rely on picking up odd copies of American mags at second-hand bookshops. I always look back with a certain amount of nostalgia on those stories, many of them good S.F., though since those days this type of writing has matured considerably. People often used to say to me then: "I'm surprised at you reading those books, 'Atomic Energy,' what nonsense." They are the very people who today expound to all and sundry the theory of nuclear fission. From 1939-50 there was a gap in my reading, then about three years ago I read two or three American publications and was disappointed at the deterioration that had taken place; most of them could only be described as utter drivel. Since then there has been a spate of British published S.F., the covers of most of them, I may say, being quite attractive. It wasn't 'til the other week that I spotted *Authentic* tucked away at the back of a newsagent's stall. Need I say more when I say that I am already a subscriber after having read the (for me) first one.

J. Houghton,
128 Alcester Road South,
Kings Heath, Birmingham 14.

Nice to have you back in fandom, Mr. Houghton. Don't go away again. The more the better.

LIBRARY

I have noticed a letter in the 49th issue of *Authentic* regarding the Redditch Branch library of L.S.F.O. It is at the undernoted address. If you would kindly mention this in your next issue I would be obliged to you as I have been trying to form a local group.

E. Cox, 163 Enfield Road,
Hunt End, Redditch.

Gladly, Mr. Cox. All part of the service!

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H.M., Dumfriesshire, Scotland

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G.A.S., Ossett, Yorks

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Mrs. C.A.H., Coventry

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F.F., Hertford.

Dear Sirs,
I bought an APAL from you nearly eighteen months ago, and it did for me all that you said it would. I have not smoked for seventeen months, and have no desire at all to do so.
G.H., Marham, Norfolk

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